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HOUSEHOLD USE OF HEATING DEVICES.

A letter upon another page from one of our readers calls attention to the difficulties raised by the National Electrical Code against the use upon lighting circuits of heating devices which require more than 660 watts. A Code rule requires that every branch cut-out shall be fused for a value of the current representing approximately the above wattage, and consequently an ordinary fixture or other outlet which has been wired for lamps is not in condition for supplying current to such a heating device. In spite of this it is quite customary to provide heating apparatus of such capacity with an ordinary Edison plug which invites the consumer to attach it to a lighting socket.

Evidently little consideration is given either by those who framed the Code or by the electrical manufacturers to the requirements in this matter. If the general use of heating and cooking devices is to be encouraged and developed, provision must be made both by the manufacturers and by suitable wiring, installed under Code rules, to make the use of household apparatus easy. While it is true that most of the ordinary household devices do not consume over 500 watts, it must be remembered that when such a load is added to a circuit which already has its full quota of lamps, the circuit may be overloaded, or at any rate may draw more current than the specified fuse will stand. This is at once an inducement to overfuse the circuits, or what is far too customary, to replace the fuse by a permanent conductor. Such procedure is of course entirely unjustified, and yet if it is not made easy for the user to follow correct procedure it must be admitted that such improper procedure will become habitual.

In these days when heating devices are becoming quite common, it would probably not be asking too much to require every fixture to be wired so as to be capable of transmitting 500 watts, and permitting branch circuits to be fused up to their actual safe carrying capacity. In the case of apparatus which require a larger wattage than this, special provision should be made by running a suitable circuit, and the connection should be of a kind that is adequate for this purpose. To terminate the leads of such an apparatus with an ordinary Edison plug is certainly undesirable and only invites objectionable practice with possible disaster to the user.

Co-operation on the side of the contractor, as well as between inspector and manufacturer, is necessary before desirable conditions will be fully realized.

CALLING ON OLD CUSTOMERS.

In the ordinary course of events when a central-station power solicitor secures a contract from a prospect, he makes it a point to see that service is furnished at the earliest possible moment; perhaps, in some cases, also calls to see that the installation is operating satisfactorily and then promptly forgets the entire transaction. This procedure while it may vary in some localities, is quite generally true, and as regards the latter feature is obviously an unwise one.

The new customer may or may not be satisfied with the new arrangement in his plant; through the unfamiliarity of his operators with electric machinery it may happen that the promised economies are not being realized; or the first or second bill may be higher than the solicitor led him to believe. Perhaps it was a misunderstanding on the part of the customer—in any event it does not necessarily follow that because he is dissatisfied he will make known his grievance to the company; in fact he may nurse that grievance for the entire time he has dealings with the central station, and ultimately the company will be the loser.

It should also be remembered that all complaints do not originate during the first week or month, so that calling on a new customer a time or two during that period is no excuse for a clear conscience on the part of the solicitor. A case that illustrates how a minor grievance can make a "knocker" out of an otherwise satisfied customer is that of a bakery in a Southern town. The manager of this bakery was thoroughly satisfied with his motor installation, but desired to improve his lighting facilities. Not having come in contact with any of the employees of the central station, and in fact not knowing that an illuminating-engineering department was maintained for its customers, the manager purchased a number of tungsten lamps from a local dealer. The new lamps gave only about one-half their rated life and another trial was made with the same result. Finally the old carbons were replaced and the manager developed a grievance; it is true it was not justified, but nevertheless it was a grievance against the central station that threatened to end disastrously. It was by merest chance that a representative of the company had occasion to call on the manager of the bakery, and learned of the lamp incident. A voltmeter was brought into play, the proper lamps recommended and a satisfactory lighting installation subsequently made. This is simply one of the many incidents that are occurring daily and serves to emphasize the importance of keeping in close touch with old customers. Then, too, disregarding the matter of grievances and complaints, a solicitor by keeping constantly in touch with a customer will be in a position to appreciate the conditions in his plant, make various recommendations as to installing additional equipment to keep abreast of growing requirements, substitution of current-consuming devices for steam or gas apparatus, etc., giving the manufacturer engineering advice that will mean the more efficient operation of the plant in question and incidentally an increase in the revenues of the central station.

In most localities solicitors are so busy endeavoring to secure new business that they do not feel inclined to "waste" time calling on those whose contracts they have already secured, but it should be remembered that one of the strongest influences that can be brought to bear on a prospect is the testimonial or recommendation of a satisfied customer, or perhaps a visit to the plant of a present customer. When this feature is taken into consideration the power solicitor will feel that his first duty in securing new business should be periodic visits to his old customers.

RELATIONS WITH HYDROELECTRIC COMPANIES.

A natural monopoly of the business of selling electric power is seldom, if ever, realized by central stations. Competition is almost always at hand in the form of small prime movers operated by steam, gasoline or oil; and more and more the utilization of the wasted energy of distant waterfalls is becoming a factor in the supply of power in populous centers. With the former question, the central-station manager faces the clearly defined issue of direct combat; but with the latter phase of the power situation, complications frequently arise, and as a result it is difficult to determine the policy best to follow. The cost of producing electrical energy, including all charges, is, or should be, known, within the extreme limits of engineering accuracy, so far as every established company is concerned. The cost of delivering power at any given point on a hydroelectric system is a very different matter, and must be considered along with the reliability of the proposed service no less than the price at which the water-power organization seeks to enter the market.

Wise managers of electric lighting and power companies who have faced this question frankly have worked out their plans along the line of endeavoring to supply their communities with electrical energy at the lowest rate consistent with all the conditions recognized, and they have striven to distribute electricity as economically as possible by making arrangements with water-power companies for the interchange of energy on equitable terms when convinced of the economy and reliability of the hydroelectric service. The central station, however, finds itself more and more able to compete with water power on even terms, as it takes advantage of the productive economy of very large steam-turbine units. The fuel cost goes down remarkably per unit of output in the operation of turbine sets of from 8,000-kilowatt capacity upward, and the labor cost drops to almost ridiculous figures. The policy of cultivating the day load—and the night power load also, when possible—combined with the use of large generating units in meeting the needs of rapidly growing manufacturing centers, puts an entirely new face upon the question of competition from water powers. Not that the hydroelectric service may shrink in value, so long as it is reliable, but its usefulness tends to be-

come supplementary rather than fundamental, especially if long transmissions are required, or if the water-power interests reach out for distant markets when the nearer fields of service remain unexploited.

In the last analysis, every community properly seeks power at the lowest cost consistent with its conditions. The entrance of a hydroelectric supply may facilitate the attainment of this ideal, or it may not. The plain responsibility of the central station is to investigate the cost of its own service first, with impartial accuracy; then to ascertain whether it will pay to purchase water power and distribute it within its field; and above all, after these points are determined, to look deeply into the reliability of the hydroelectric service and to make an estimate of the financial feasibility of its offered rates. If the investigation shows that the water-power company can afford to supply electricity at a rate sufficiently low to warrant the making of an interchange contract, well and good. It will not do to adopt the position of letting the hydroelectric interests bear all the burdens of misjudgment, and for this reason: a central station must above all be prepared to meet the demands for increased service within its rates to an unlimited extent as its community grows, and if, through any arrangement with an outside organization, it falls short of supplying the total amount of power demanded, it runs the risk of losing its hold upon the community as a reliable and efficient business organization. The responsibility for the pecuniary success of the competing hydroelectric enterprise rests with the water-power interests; but in facing its full duty to its consumers, the central station must form an accurate judgment as to the financial merit of any outside supply and bear it constantly in mind in making arrangements for the future and larger service which it is itself bound to render. Hydroelectric service is doing splendid work in the world today in co-operation with central stations; it is even reaching certain classes of large consumers which could only with the greatest difficulty be supplied by a centralized steam plant of moderate capacity, depending upon reciprocating engines for its operating economy; but on the other hand, the advent of the large steam turbine is putting the central station into a position so strong that it may well require a convincing demonstration of the economy of a new supply from outside its domains, before deciding to enter into a co-operative buying and selling agreement. Experience is showing that while there are many benefits to be gained from co-operation, there is little to fear in central-station circles in the way of destructive competition from the entrance of hydroelectric power projects as factors in the industrial situation.

Even where hydroelectric power is utilized in large quantity, it is desirable to keep a steam generating station intact as a reserve for emergency use. Where hydroelectric power is obtained from several different water powers, continuity of service is perhaps best insured; but even under this condition, a long summer drought may reduce the available supply below the minimum.

CONCERNING THE NEW-CODE WIRE.

In almost any type of interior electric wiring the useful life of the circuit depends in a large measure upon the quality of the insulating coating on the wire used. Even in the case of exposed knob or cleat work it is not generally advisable to continue the use of a circuit after the insulation on the conductors has become defective; while, on the other hand, the use of a metal-clad circuit at all, after serious defects have developed in the insulating covering of the conductors, is generally impossible, of course. It would seem, then, that definite and effective provisions for insuring the general use in indoor electrical construction of only such wire as is provided with a uniformly good and permanent insulation must prove of very great value to the electrical industry. It was with a view to promoting such practice that the revised and amended specifications concerning rubber-covered wire were incorporated in the latest edition of the National Electrical Code. This change in the Code would therefore appear to be unquestionably timely and important.

For a time after the appearance of the 1911 edition of the Code, the requirements concerning rubber-covered wire were apparently the source of more or less uneasiness on the part of certain electrical interests. It was feared that the cost of this higher grade of wire would be excessive; and that manufacturers of wire would not supply it so promptly as might be desired, or that if the supply should be prompt and ample, contractors and supply men might be left with large quantities of the old wire on their hands, which inspection departments would make it impossible for them to dispose of without considerable loss. The developments of the last few months, however, indicate that such apprehensions were for the most part without foundation. It seems, for instance, that the price of the new wire is not greatly in excess of that of the old, the difference amounting to an increase of probably not more than five per cent. Moreover, in most cases, inspection boards have apparently given contractors ample notice of the dates after which the old wire will no longer be approved, thus giving them an opportunity to dispose of the old stock and supply themselves with the new. As previously explained in these columns, the greater number of inspectors fixed April 1 of the current year as the date limit for the smaller sizes of old-Code wire and July 1 as that for wires of all sizes. So far as the market supply of the new rubber-covered wire is concerned, the records of the Underwriters' Laboratories show that many of the companies have been making this wire for some time. The fact that old-Code wire will be approved in Canadian cities until 1913, may lead manufacturers in the United States to continue making it for a while yet. But there seems to be no real reason why its use should not be discontinued promptly in the United States, nor why the general and prompt adoption of the new wire should prove seriously inconvenient.

Section of the Illuminating Engineering Society Formed at Pittsburgh.

At a meeting held in the assembly hall of the Fort Pitt Hotel, Pittsburgh, Pa., on the evening of February 13, a new section of the Illuminating Engineering Society was established. The meeting was held in connection with a dinner. Prof. H. S. Hower acted as toastmaster. Among the speakers were: V. R. Lansingh, president of the Illuminating Engineering Society; Preston S. Millar, general secretary of the Society; G. H. Stickney, chairman of the New York Section; Norman Macbeth, vice-president of the Society; T. M. Trimbell, chairman of the Pittsburgh Section of the American Institute of Architects; R. B. Shover, president of the Association of Iron and Steel Electrical Engineers; J. S. Orr, general superintendent of the Allegheny Light Company; William Duncan and T. R. Cook, of the Pennsylvania Railroad.

As the result of the general discussion the national officers of the Society who were present authorized the formation of the section. The following officers were elected: Chairman, H. S. Hower; secretary, C. J. Mundo; managers, W. Edgar Reed, C. E. Clewell, S. B. Stewart, E. R. Roberts and W. M. Skiff. In one sense this is a reorganization of the former section of the Society that had its headquarters at Pittsburgh, but which was disbanded in 1907. The new section has a membership of nearly 100 and will take in its territory the western part of Pennsylvania and a considerable portion of Ohio, including the cities of Cleveland and Newark, in which there are a large number of members of the Society.

Government Control of Public Utilities.

On Tuesday, February 27, Peter S. Grosscup, former judge of the federal court, spoke to a very well attended meeting of the Commonwealth Edison Section of the National Electric Light Association, on the control of public utilities by the Government, and the relations of the public to the public-utility company. Over 500 members were present at the meeting.

Opening the session Samuel Insull, who introduced the speaker, called attention to the erroneous idea of some people that investors were opposed to governmental regulation. Mr. Insull has always been a firm believer in regulation of this sort, for there are certain businesses that can only operate successfully as monopolies. They must exist but should be controlled.

Mr. Grosscup remarked in the course of his address that he believed this electrical age to be the most interesting, and of the most importance of any in the world's history. The problems that have arisen with it demand recognition and must be faced, though there may be many complications.

Germany solved its "trust problem" early by government control, and in that country proofs must be presented that dividends have been earned before they are declared. In England a corporation can be created only by an act of Parliament. These countries have found it far better to regulate the big businesses than to encourage ruinous competition.

The growth of the combine and the increasing importance of the question was taken up and as an example of the wrong methods of solution the case of the Chicago gas trust was cited. This was one of the first cases that came up, and it was ordered that the company dissolve into its original component companies. The cost of service was thus greatly increased.

Mr. Grosscup concluded by saying that the solution of public-utility and other regulated-monopoly problems would come from the people as solutions of other questions had come. While the process may be wasteful, development will certainly come and a solution will be reached in the near future.

A number of entertainment features were provided for the members present which added much to the pleasure of the evening. Several pieces were given by the Commonwealth Edison Orchestra, under the leadership of Mr. Eastman, and the Glee Club also sang several numbers.

New Developments in Steam-Turbine Engineering.

At a meeting of the Western Society of Engineers held on the evening of March 4, Edwin D. Dreyfus, of the Westinghouse Machine Company, presented an illustrated paper entitled, "New Developments in Steam-Turbine Engineering." The paper dwelt at some length on the various types of Westinghouse-Parsons turbines ranging in size from less than one kilowatt up to 20,000 kilowatts rating. After referring to the inherent advantages of the steam turbine as compared with the reciprocating engine, Mr. Dreyfus traced the development of the high-pressure turbine and the improvements in the design, the manufacturers having eliminated all the elements of weakness that were present in the earliest types. Among these improvements is the development of the double-flow type which has materially reduced the bulk of the machine and improved its operating characteristics. Mr. Dreyfus also described in some detail the design, peculiarities and use of low-pressure and mixed-pressure turbines and of the so-called bleeder type.

Aside from its use as a main prime mover the steam turbine is now being extensively employed for auxiliary service, such as operation of direct-current exciters, simple and multi-stage centrifugal pumps for boiler-feed and for circulating service. In connection with condensing equipment a new type of turbine-driven air pump has been adapted to the Leblanc condenser. Turbines have also been used for driving air compressors and blowers for mechanical draft. In train lighting small turbines are mounted directly on the locomotive for driving direct-connected generators for headlight service, or they are placed in the baggage car and operate, either directly or through belt, generators for lighting the entire train on the head-end system. In the conclusion of the paper considerable space was devoted to the McAlpine-Melville reduction gear, which is used as a means of connecting a high-speed turbine with relatively slow-speed machinery. It has proved particularly serviceable for driving large direct-current generators, for driving main propellers on steamships, and also for heavy rolling mills.

The paper was briefly discussed by W. L. Abbott, H. Almert and P. Junkersfeld.

Electric Railway Convention.

The 1912 convention of the American Electric Railway Association will be held in Chicago, Ill., October 7, 8, 9, 10 and 11. Thirteen years have elapsed since the Association previously met in Chicago and as the last conventions have been held on the Eastern seacoast, it was decided by the Convention Committee that circumstances demanded that the next convention be held in the Middle West.

The Manufacturers' Association will hold an exhibit at the Dexter Pavilion. Forty-third and Halsted Streets. This building is splendidly equipped for the purpose.

Wireless for Portugal.

For some considerable time Portugal has been conducting negotiations with the Marconi Company and the German Wireless Telegraph Company for the establishment of a system of wireless telegraph.

The Government finally decided to give preference to the Marconi Company.

Stations will be erected at Lisbon, Oporto, Sao Miguel in the Azores, at Funchal in Madeira, and at St. Vincent in the Cape Verde Islands.

Matthew C. Brush.

Matthew C. Brush, one of the most noted street-railway and traction executives in the East, has just been appointed second vice-president of the Boston Elevated Railway, with special duties to be assigned by the executive committee and by the president.

The rise of Matthew Brush in the street-railway world has been rapid, but fully merited by his talents. He is 37 years old and he has had a thorough practical experience from the ground up. He was born in Stillwater, Minn., graduating from Armour Institute in 1897. He graduated from the Massachusetts Institute of Technology in 1901. He paid for his higher education in these technical institutions by his own work and enterprise, pegging steadily away until he won his degrees. When he launched into the whirl and competition of the railway business this steadfastness of purpose became the foundation of his later successes.

Finely equipped technically he has the added gifts of practicability and executive ability, combined tact and a genuineness that makes everyone coming in contact with him feel that he is a friend. It is said of him that he could do more business in an hour offhand, with less fuss and feathers than the average corporation official could transact in a day.

After leaving Massachusetts Tech he entered the machine shops of the Union Pacific at Omaha as an apprentice, where he served his time. He then went to Council Bluffs as a machinist, and from there went back to Chicago, where he took a position with the Chicago, Burlington & Quincy road. He had already served as a rodman in Kansas for the Chicago & Rock Island.

Matthew C. Brush,
Second Vice-President of the Boston Elevated Railway.

In 1904 he joined the staff of the Boston & Suburban Electric Companies, as assistant to the president. At that time the properties consisted of nine street railways, a gas company and two amusement parks. In eight months he was elected general manager of the properties. In 1905 he was made vice-president and general manager and a year later was also made head of the Suburban Manufacturing Company, which was formed to build a $300,000 power house in Waltham.

Through his efforts the Boston & Suburban lines, which had previously been losing a great deal of money, were put upon a sound financial basis. His administration was marked by a co-operative policy between officials and employees, and when he resigned in 1909, 500 officials and employees of the company gathered in theatre of Norumbega park to express their regard for him.

He left the Boston & Suburban to become general manager of the Buffalo & Lake Erie Traction Company, the Jamestown, Chautauqua & Lake Erie Railroad and the Jamestown & Chautauqua Steamship Company, operating 200 miles of electric lines, fifty miles of steam road and a fleet of steamboats on Lake Chautauqua. He remained in this position a year, when he was called back to Boston to become assistant to the vice-president of the Boston Elevated Railway, which controls the largest traction system under one unit in the world. For the past year he has been chairman of the efficiency committee, which acts as an advisory and assistant committee to the president, executive committee and the vice-president. He will begin his new duties on March 1.

Mr. Brush is a member of the Newton Club, the Fales Club, the Waltham Business Men's Club, Delta Kappa Epsilon, New England Street Railway Club, the Boston City and University Clubs and an associate member of the American Street & Interurban Railway Association.

Speaking of the Boston traction service at a meeting in Wells Memorial Hall held recently to discuss the subject—"How Can Overcrowding in Street Cars Be Avoided," Mr. Brush said he believed that the solution was in overcoming the physical peculiarities of Boston by new facilities and by using the new large prepayment, semi-convertible cars, of which 100 are now in use and more ordered. Eventually the entire system will be using them. The company now has 28 miles of cars, and extra cars were impossible in the congested section of the city, which contains only five miles of outward bound tracks, against over 700 miles on the entire system. Many problems of this nature are being continually put up to him and many are being solved daily.

Boston Electrical Luncheon.

At the weekly meeting of the Luncheon Club of the New England Section of the National Electric Light Association, held at the American House, Boston, on March 1, Arthur E. Kennelly, professor of electrical engineering at Harvard University, addressed the assemblage upon the subject of "Electrical Communication." Over 300 electrical men from all parts of eastern New England formed an appreciative audience. Dr. Kennelly reviewed the history of ocean-cable communication, and said that all the intercontinental lines now in use would extend about 225,000 miles if made into a single conductor. Fifteen ships are now required to maintain the world's cable system, and over a dozen transatlantic cables are in constant service, at a cost of about $3,500,000 each. Dr. Kennelly spoke at some length upon the powerful influence of the submarine cable in dissipating insularity and bringing all nations into closer relationship. The contrast between the present and the past is realized by such a fact as that the result of the Battle of New Orleans in 1815 was not known at Washington until three weeks afterward, while in 1898, Admiral Dewey's victory at Manil was known before it occurred—figuring on a local time basis.

Taking up the future of wireless telegraphy and telephony, Professor

Kennelly said that there is no immediate prospect of the cable companies going out of business, although the time will probably come when no more cables will be laid under the seas. The problems of interference and of wave concentration are in a fair way to be solved in time, especially the former. A great point in favor of wireless telephony is the fact that as far as one can hear the signals at all, so far he can hear intelligible words. The present facilities of wireless telegraphy give the ocean operator a working range 400 miles in diameter under usual conditions. One transatlantic wireless service is in regular operation. The outlook for wireless telephony appears better than that for cable telephony over long distances. Dr. Kennelly said that even if the average individual does not use them, the facilities now under the seas which make it possible to send a word practically anywhere for a maximum price of about $1 give the human race a potentiality never before enjoyed. There is no known limit of durability in a submarine cable laid on a sandy or muddy ocean bottom. Existence has been wonderfully unified by electric communication, which is destined to play a still more prominent part in the future unification of the world.

The speaker announced for the luncheon of March 8 was Milton W. Franklin, of Schenectady, N. Y., his subject being "Ozone."

Program of the Iowa Convention.

Arrangements for the coming convention of the Iowa Electrical Association and Electric Show are nearing completion. The program will include papers upon the following subjects: "Building Up a Day Load for Small Central Stations"; "Central-Station Heating"; "Representative Motor Installations in Iowa"; "High and Low-Pressure Steam Turbines"; "Boiler-Room Economies"; and "The Care of Consumers' Meters." There will be reports of committees on Grounded Secondaries, Street and Curb Lighting, Facts and Factors, Affiliation with National Electric Light Association, State Commissions and on Uniform Rates.

The sessions of the convention will be held on April 24 and 25 in the Coliseum Building at Des Moines. The Electric Show will continue four days from April 23 to 26, and will be held in the same building. W. H. Thomson is chairman of the Committee on Arrangements for the show. The manager of the show is C. A. Willoughby, of the Des Moines Electric Company.

Applications already received show that all of the exhibit space will be taken up. The show will be conducted on a larger scale than ever before attempted by the Iowa Association. Exhibits will be made by the Government Signal Service and the Navy Department, and there will be a number of other attractive features of general interest. Music will be rendered in the afternoons and evenings by a band and soloists. The electric-vehicle manufacturers are taking an active part in the show.

Jovian Rejuvenation at St. Louis.

Twenty-seven candidates, among whom was Alfred C. Einstein, vice-president and general manager of the Union Electric Light & Power Company, and head of the Suburban Electric Company, of St. Louis County, were initiated at the rejuvenation conducted in St. Louis on the evening of February 23. Besides Mr. Einstein, there were other influential electrical men of St. Louis in the new additions to the Jovian order. This is the second rejuvenation held in St. Louis in less than a year. The number of candidates admitted at this latest rejuvenation was five more than that of last March. The interest aroused by Statesman Louis F. Philo's campaign for new members is expected to result in more initiations in the near future.

The initiatory ceremonies were conducted in the Elks' Club following a banquet at which there was much sprightly and beneficial oratory. Past Jupiter S. A. Hobson was chairman of the gathering in the banquet hall and toastmaster during the banquet. Tenth Mercury Ell C. Bennett in an address to the Jovians and candidates took for his subject the progress and the serious purpose of the order. Aside from figures showing the numerical growth of the organization in the last four months, he referred to the high personal and important official character of many of the men who have joined the order in that period. He called attention also to the formation of Jovian Leagues in a dozen of the principal cities of the North, East, South and West, and to the active organization of Jovians in the establishment of electrical pages in leading daily newspapers, among them those in Cleveland, Pittsburgh, Philadelphia, Buffalo and Denver.

Statesman-at-Large Charles L. Martin, Dallas, Tex., was a guest and speaker at the banquet. He promised in behalf of Texas Jovians that the Lone Star State would be strongly and ably represented at the order's annual meeting in Pittsburgh next October. He gave the first news of the organization of a luncheon club in Galveston, and declared that this was the first of several like clubs which are to be established in other Texas cities.

Resuscitation from Electric Shock.

The first meeting of the Commission on Resuscitation from Electric Shock was held in the board room of the National Electric Light Association, New York City, on February 22. This commission was organized upon the initiative of the National Electric Light Association, and has for a purpose the study of electric shock and the preparation of a set of rules for first aid in case of electrical accident. The commission is composed of members of the American Medical Association, National Electric Light Association and American Institute of Electrical Engineers, as follows:

Nominated by the American Medical Association: W. B. Cannon, Harvard University, chairman; George W. Crile, Western Reserve University; Yandell Henderson, Yale University; S. J. Meltzer, Rockefeller Institute for Medical Research; E. A. Spitzka, Jefferson Medical College; W. D. Weaver, editor *Electrical World*, secretary.

Nominated by National Electric Light Association: W. C. L. Eglin, Philadelphia Electric Company.

Nominated by American Institute of Electrical Engineers: Elihu Thomson, General Electric Company; A. E. Kennelly, Harvard University.

At the meeting, the medical members of the Commission unanimously advocated the Schaefer, or prone, method as the best means in the hands of laymen for maintaining respiration in victims of electric shock, and the Commission formally voted to recommend this method. A chart is now being prepared which will give details of first aid in cases of electric accidents and will describe fully the method of applying artificial respiration. This chart will be issued under the auspices of the National Electric Light Association.

Growth of N. E. L. A.

The membership of the National Electric Light Association is now about 10,800 and efforts are being made by the secretary, T. C. Martin, to reach the figure of 12,000 before the Seattle convention. For the first time in its history the Association now has a membership of over 1,000 central-station systems, representing about 1,500 operating companies.

Safety Committee Offers Help.

Chairman L. R. Palmer, of the Safety Committee of Iron and Steel Electrical Engineers, has made an announcement offering advice and suggestions on behalf of his Committee to all manufacturers, without cost or obligation. This Committee offers to inspect plants and make suggestions for the installation of safety appliances without selfish purpose.

Electric Power and Heating in Candy Manufacturing.

Although the matter of cleanliness should alone be of sufficient importance to dictate the adoption of electric power and heat to the candy-manufacturing industry, large amounts of steam are required and most manufacturers, therefore, have erroneous ideas as to the cost of power where a steam engine is used. This article discusses the cost of steam and electric power, gives power requirements of various machines used and descriptions of typical electrical installations.

In recent years there has been a marked tendency on the part of manufacturers to improve sanitary conditions in their establishments. Particularly in plants where food products are manufactured or handled has this tendency been noticeable and today, it is gratifying to know, that practically all manufacturers are keenly alive to the desirability of maintaining a high standard of cleanliness in their factories. In candy factories, it is of course recognized that scrupulously clean surroundings are absolutely necessary to prevent foreign substances from entering the various ingredients and, also, there must be no odors or gases which might taint the product. Aside from the many other advantages of electricity, cleanliness alone would seem to be of sufficient importance to dictate its adoption in this industry.

In considering the subject of electric power and heat in candy factories, it is well recognized that in many small plants the manufacture of candy is often combined with an ice cream and perhaps, also, a bakery business, all coming logically under the classification of confectioneries. It is true, however, that many of the conditions that apply to one do not apply to the other and this article, therefore, will be limited to the application of electricity to candy manufacturing. Subsequent articles will treat of electric power in bakeries and ice-cream plants. While wholesale candy factories have been taken as typical of the plants in this industry, it is believed that the data given can be applied to the candy shops of the retailers.

In the old-fashioned candy factories it was the general custom to run a vertical shaft from the engine in the basement right through the floors above, and to connect the group shafts on each floor with this vertical one. From 25 to 40 per cent of the engine's power was lost in transmission through the vertical shaft alone and a great deal of power was continually going to waste in running idle shafts, pulleys and machines.

Motor-Driven Revolving Pans—Bunte Brothers, Chicago.

It is obvious that electric motor drive possesses many advantages and is being rapidly adopted in candy factories. It has been demonstrated under the severest service conditions that the electric motor renders possible the

most economical approach to the direct application at the machine of the total initial power developed. Also, the better lighting and ventilation and the lessened danger of physical injury resulting from the removal of belts and shafting have been found by experience to increase the productive efficiency of the employee.

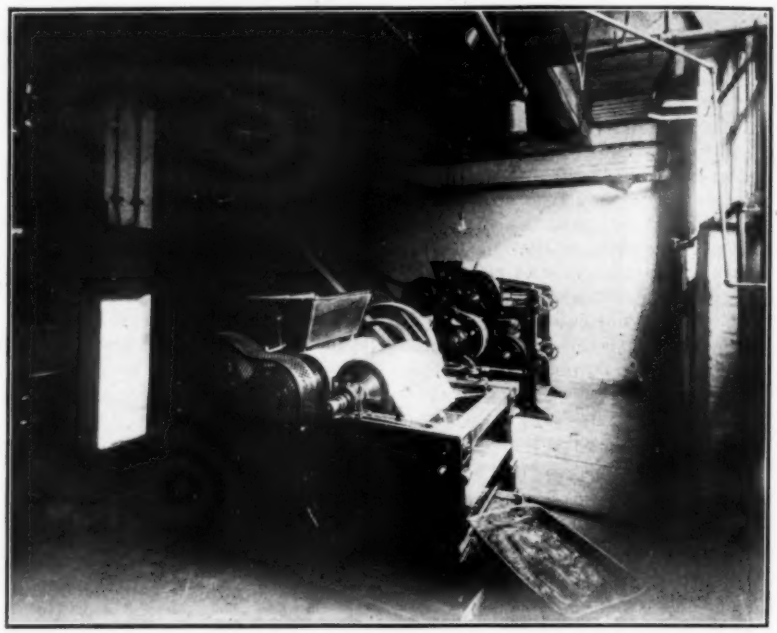
Another feature in connection with electric drive that, although well known, cannot be emphasized too strongly, is the absence of breakdown troubles. Experience has shown that where motor drive is employed the delays, occurring so frequently in steam plants, are practically eliminated. The necessary expenditures for repairs is very much less than where belts and shafts are used.

An important advantage of individual motor drive is the ability to operate any group of machines, or any separate machine overtime or at unusual hours without putting the whole plant into operation. Thus the cost of operating any machine stops when the machine does.

In soliciting the adoption of electric drive for candy factories a great proportion of success depends upon the attitude on the part of the central-station power solicitor to correctly analyze existing plant-operating expenses and fixed charges. Ability to do this readily and correctly will go far to demonstrate definitely and convincingly to a prospect the flaws and waste and general field for improvement in his power layout.

Candy factories require a considerable amount of steam, and, for this reason, in determining the relative merits and economies of various systems of drive, it is often argued that the additional coal for sustaining sufficient boiler pressure to operate the engine is negligible when compared with the fuel needed solely to obtain steam for candy cookers, etc., therefore the engine is considered to perform functions of a cheap and effective reducing valve between boiler and heating systems, practically generating at no cost the mechanical power required.

This contention may have value in those rather rare instances of a model plant where the mechanical drive has been installed to show maximum efficiency, live-steam piping tight and well lagged, the exhaust carried with a minimum of back pressure to proper heaters and cookers as well as providing steam for those machines which permit a satisfactory operation at very low pressure—in short, in installations where all the engineering niceties and refinements have been carefully introduced, it might be doubtful if the change over to electric drive, with steam for heating and cooking alone, could be made to show an appreciable saving, judged exclusively from the standpoint of the coal pile.



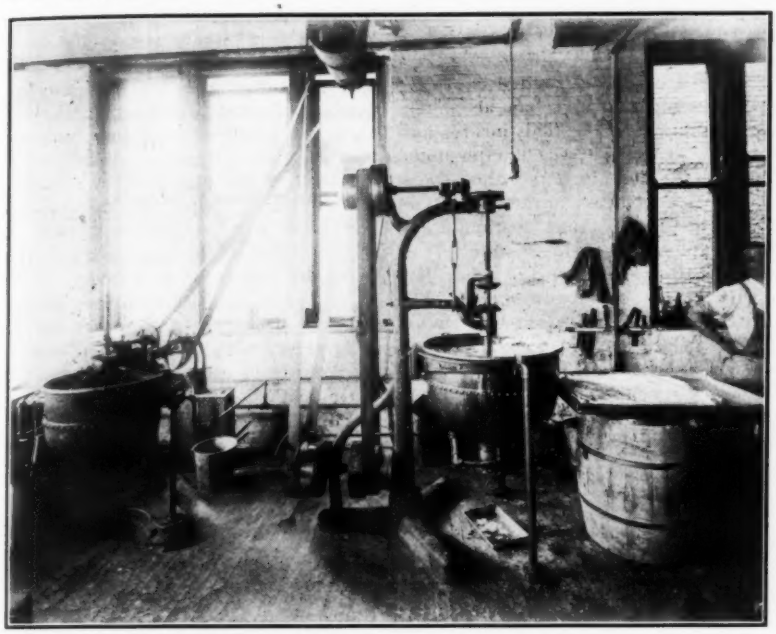
Two Motor-Driven Chocolate Grinders.

However, after considering that the average small plant labors against serious wastes in boiler and engine room (incident to careless firing; leaky pipes and valves; wear and tear; decrease in production due to slippage of belts; danger of same to women operators; friction losses and bearing troubles accompanying long lines of shafting; dependence for continuous operation on one prime mover, and the greater time required for repairs should this single source of power fail) it is to be questioned whether the coal-pile argument may not be justly relegated to a position of minor importance.

Candy cookers require live steam, hence a large proportion of the total steam generated must be delivered at boiler pressure. In determining the thermal value of the exhaust from a low-pressure engine, due consideration must be given to such variables, as ini-

Motor-Driven Mixing Kettles.

tial gauge pressure and point of engine cut-off, also taking into consideration radiation losses and leaks in main piping, engine cylinder, etc. While under the best conditions it may be possible to realize at boiler pressure, ninety per cent of the heat units contained in the steam at boiler pressure, approximately one-quarter of this amount must be used for heating boiler-feed water, and after deducting for inefficient pipe and cylinder lagging, badly packed glands, leaky valves and joints, and the loss chargeable to engine repair and depreciation, as well as the additional expenditure for oil, waste, packing, etc., it is evident that the value of the thermal units remaining for useful work may be considerably reduced. Also, when steeam is used for supplying both power and heat, well sustained and constant gauge pressure is indispensable, if the gauge and the various driven machines are to be kept at normal speed and maximum rate of production.



Motor-Driven Cookers.

A Section of Bunte Brothers' Plant.

The economy of electric drive is particularly marked in those cases where the proportion of actual to connected load or total output is small. In a steam-driven plant, the general arrangement and the number of prime movers used, the distance between same and the various driven machines; the length as well as the alinement and proportion of shafting and belting, etc., all affect the ratio between the average amount of energy used and the total output of driving power. It is well known that the transmission losses are seldom less than 40 per cent.

Before entering into a discussion of power requirements of candy machines, it may be of interest to state briefly the principles of candy making. Syrup that is made by boiling sugar and water together is the basis or foundation of most candies. The quality of the candy depends upon the quality of this syrup, therefore it is of the greatest importance that the art of boiling the syrup should be thoroughly understood by the attendant. Professional candy makers are guided by a scale of degrees through which sugar passes as it boils. These degrees, which may also be familiar to the amateur, are thread degree, pearl, blow, feather, ball, crack and caramel degree. This last degree is when the sugar loses its clear appearance and begins to take on a straw color. This is a critical moment and the cooking must cease or the syrup will soon burn.

When the syrup has arrived at the proper degree, it is at once poured off on a slab to cool.

Pan goods are made in various shapes such as beans, round drops, short drops. Centers are made in the machines and are then placed in the revolving pans where syrup and sugar are added. The syrup drips down upon the centers and enables them to gather the sugar as a snowball gathers snow. After the proper size is reached, color is added and the marbles or balls are polished. The grade of candy manufactured ranges from three and a half cents per pound for barrel gum drops to eighty cents a pound for high grade chocolates, retail price. Chocolates are placed in a chill room and kept at a temperature of 44 degrees to harden.

Power Requirements.

Candy from the viewpoint of the wholesale manufacturer is classified as pan goods, gums, creams, chocolates, hard-boiled goods, caramels, cocoanut bars, hand-dipped fine creams and marshmallows. These kinds of candy in all their variations give rise to over 50,000 different kinds of confection, and the number is constantly increasing. It will be seen, therefore, that it would be impossible to give the power requirements of every machine

used in this vast industry. The accompanying table gives, however, the power requirements of a number of the machines common to practically all plants. Individual conditions should govern the size motor applied in every case.

Machine.	Horsepower
Marshmallow Kettle	1
Starch Buck	.1
Starch-Cleaning Machine	0.5
Jap Kettle	1
Nauget Mixer	1
Fig Machine	0.25
Nauget Cutter	0.5
Peanut Roaster	0.25
Peanut Husker	0.5
Cocoa-Bean Roaster	3
Almond Crusher	0.5
Caramel Sizer	3
Lozenge Mixer	2
Lozenge Roller	1
Lozenge Dough-Breaker	2
Candy Puller	5.5
Candy Polisher	1.5
Candy Roller	1
Candy Mixer	3
Schutz Sugar Pulverizer	15
Sugar Mixer	5
Candy Rocker	0.75
Corn Sheller	0.5
Sugar Grinder	5
Sugar Bolter	2
Mixing Kettle	2
Chocolate Dipper	1
Drilling Cream Grinder	5
Werner Cream-Stirring Machine	2
Drilling Cream-Stirring Machine	5
Depositor	0.5
Printer	0.5
No. 3 Lehman's Chocolate Melangor	5
Small Chocolate Melangor	3
Chocolate Shaking Table	0.5
Chocolate Mixing Kettle	1
Chocolate Rolling Machine	5
Walters Chocolate Mixer	0.5
Walters Chocolate-Dipping Machine	0.5
Holmes Chocolate-Coating Machine	0.5

A machine, not included in the list given, which lately is coming into extensive use in candy factories is the blast gas candy furnace. In many of the smaller plants gas cooking is exclusively employed and by the addition of a motor driven blower an intense and more evenly distributed heat can be obtained insuring most perfect results. One of the accompanying illustrations shows a blast furnace built especially for use with motor-driven blower. The furnace has a double insulating, refractory lining arranged to radiate and concentrate the heat against the bottom of the kettle, as well as to prevent heat escaping into the room. Owing to its rapid work and close regulation no goods are burned or spoiled, and the increased amount of perfect goods produced make it a most economical furnace to use. Fractional horsepower motors are used for the blowers.

Electric Heating.

Electric heat is particularly well adapted to the demands of the confectioner, supplying a clean, flameless heat which does not increase the amount of moisture in the atmosphere; which can be closely regulated to the requirements of the work and which is economical. While as yet, it has not been found practical to apply electric heat to the large candy cookers many smaller appliances, such as chocolate warmers, batch warmers, bonbon kettles, decorating funnels and drying tables are provided with electric heat and the success with which they are meeting indicates that a rapid extension of electheating in candy factories is inevitable.

By far the most common electrically heated appliance in use is the chocolate warmer or table. The use of this gives each dipper a pan of melted chocolate which is maintained as an absolutely uniform temperature. This insures uniform goods and permits uninterrupted work by the dipper. The standard pan consumes about 150 watts to start and 50 watts running, thus costing about 0.25 cents per hour to operate. It is obvious that the electric chocolate warmers have many advantages. The heater is placed in operation as simply as an electric incandescent lamp, by closing a switch. There is no water bath or piping to rust and leak. There is no gas flame to vitiate the air. The evaporation from the water bath is cut

Gas Candy Cooker with Motor-Driven Blower.

off and the moisture in the air is reduced to a minimum. A further advantage of the electrically heated chocolate warmer for refrigerated rooms arises from the fact that the dry, flameless heat results in a great reduction in the expense for cooling, a feature by no means unimportant.

The Westinghouse Electric & Manufacturing Company has perfected an electric chocolate warmer that is being successfully used in a number of plants. It consists essentially of a chocolate pan of sheet metal, a hermetically sealed sheet-metal receptacle, containing the heating element and a control switch. The receptacle is arranged for mounting in the top of a table. The chocolate pan sets inside of the receptacle. Longitudinal lips formed from sheet metal are provided to extend over marble slabs which are used in connection with the chocolate dipping pan. The heater and conducting wires are so shielded as to prevent accidental contact therewith. Two sizes are manufactured and each has three heats—high, medium and low. When it is desired to bring the chocolate to a working temperature in a short time the high heat is used The low heat is sufficient to maintain the chocolate at a proper working temperature and the medium heat is intermediate between the high and low. A special indicating switch, having a porcelain base and an insulated nickeled metal cover totally inclosing all live parts, by means of which any of the three heats may be obtained, or the warmer disconnected from the circuit, is furnished with each warmer, together with leads for connecting warmer to switch.

The Simplex Electric Heater Company makes an electric heating element which is embodied in a warmer sold by the Confectioners & Bakers Supply Company. This heater is similar to that described above and in addition is so constructed that, by closing the chocolate pan with the marble slabs, sufficient heat is retained to keep the chocolate warm over night.

Electric pumps are found very useful in the candy business. Specially constructed pumps are employed for handling hot and cold syrups and chocolate. In pumping chocolate it is desirable to maintain an even temperature and for this purpose the Taber Pump Company has designed a special heating device to be attached to the body of the pump, fitted for electric heating coils. This device does not interfere in any manner with the successful operation of the pump, as the is not brought into direct contact with the liquid but merely permeates the shell, or case, of the pump.

Another style of electric pump takes glucose, which is used in enormous quantities in the candy business, and raises it to a height of 100 feet, if necessary, from where it is allowed to gravitate to where it is needed.

Special so-called electric shoes are also coming into general use for sealing candy boxes, etc., in which electric heat is employed.

The current consumption of some of the electrically heated appliances used in the candy business follows: Chocolate warmer, two-gallon size holding two quarts of chocolate, 110-volts, starting 150 watts, running 50 watts; batch warmer, 110-volts, 12 amperes at starting, 4.5 amperes running; bonbon kettle, 110-volts, 12 amperes at starting, 2.5 amperes running; decorating funnels, 110-volts, 30 to 100 watts.

Typical Installations.

One of St. Louis' candy factories, the Aubuchon-Garneau Candy Company, recently opened a new plant for

Candy Manufacturing Data—Sheet No. 1.

The term load-factor is used in these data in such a sense that a load-factor of 100 per cent represents the use for 24 hours every day of power corresponding to the rated capacity of the motors connected. An operating-time load-factor of 100 per cent represents the use of the rated capacity of the motors for the running hours per day specified for each installation.

Rudolph & Bauer, Louisville, Ky., manufacturers of candy and ice cream. Combination drive. Running hours per week, 42.

Total connected horsepower, 24; total number of motors installed, 8; average kilowatt-hours per month, 1143; load-factor, 8.7 per cent; operating-time load-factor, 26.1 per cent.

Kilowatt-hours, per month, for twelve months: January, 1,516; February, 1,351; March, 1,259; April, 1,325; May, 1,131; June, 1,235; July, 1,162; August, 753; September, 375; October, 850; November, 1,157; December, 1,599.

MOTOR INSTALLATION

The following is a list of the motors installed in this plant, with their respective drives. All motors are 500-volt direct-current machines.

No.	Horsepower	Application.
1	6	Belted to a line shaft driving one cream beater, one sizing machine, one caramel cutter, and one cocoanut cutter.
1	5	Belted direct to a 10-gallon ice-cream freezer.
1	10	Belted to a line shaft, driving one cream beater, on peanut blower, one pop-corn coater, one taffy puller, one caramel cutter, one sizing machine, and one peanut roaster.
2	0.5	Direct-connected to two blowers for gas cookers.
1	1	Direct-connected to carbonating machine.

J. D. Grant Company, Fargo, N. D. This company does a general candy manufacturing business. Group drive. Running hours, per week, 60.

Total connected horsepower, 15; total number of motors installed, 4; average kilowatt-hours per month, 723; average kilowatt-hours per month, per connected horsepower, 48; load-factor, 8.8 per cent; operating-time load-factor, 18.7 per cent.

Kilowatt-hours per month, for twelve months: January, 40; February, 156; March, 558; April, 900; May, 950; June, 810; July, 780; August, 820; September, 990; October, 770; November, 1,000; December, 990.

MOTOR INSTALLATION

The following is a list of the motors installed in this plant, with their respective drives. All motors are 220-volt direct-current machines.

No.	Horse-power.	Speed	Application
1	5	1,500	Belted direct to one chocolate mixer and grinder.
1	2	1,800	Belted to one rip saw and one drill press.
1	3	1,500	Belted to one caramel cutter, one sizer, one kettle, one pulling machine, and one peanut cleaner.
1	5	1,200	Belted to four revolving pans, one mixing vat, one mixing kettle, one sugar refiner, and one No. 3 pulverizer.

Plant "A." This plant, the name of which is withheld, manufactures chocolate creams, marshmallows, gumdrops, etc. There are 45 persons employed, 25 of whom are employed in the making of candy and 20 in the packing room. The capacity of this plant is 15,000 pounds per day, the average daily output being 10,000 pounds. Group drive. Running hours, per week, 60.

Total connected horsepower, 19.5; total number of motors installed, 5; average kilowatt-hours per month, 947; load-factor, 8.9 per cent; operating-time load-factor, 18.6 per cent.

The electrical energy consumption per 1,000 pounds of candy made is 4.2 kilowatt-hours.

Kilowatt-hours consumption period of one year: March, 944; April, 1,450; May, 1,350; June, 901; July, 1,000; August, 900; September, 1,490; October, 1,063; November 1,031; December, 847; January, 600; February, 774.

MOTOR INSTALLATION.

The motors in this installation are all 220-volt shunt-wound machines. The following is a list of the motors, with their respective drives:

No.	Horse-power.	Speed	Application
1	5	1,100	Belted to a 50-foot shaft (six hangers), driving one Camden Copper Works steam-jacketed cream heater, 28-inch diameter; one Racine Engine Company No. 1½ cream deposite machine; one Racine starch cleaner; one Camden marshmallow beater; one Camden 24-inch caramel heating kettle; one Camden 36-inch revolving coating pan; and one 10-inch steel-disk candy cutter.
1	3	1,435	Belted to a two-hanger shaft, driving through gears one Thomas Mills 24 by 30 by 18-inch cream beater, and one 12 by 20-inch peanut roaster.
1	2	1,200	Belted to a Buffalo 30-inch fan, 343 revolutions per minute (draws air into drying room). Also drives from extension on fan shaft, a Buffalo 16-inch fan, operating 700 revolutions per minute.
1	7.5	825	Belted to flywheel of a Remington two-ton ice machine. Flywheel, 36 inches in diameter; rim, 7 by 1.5 inches; 136 revolutions per minute. Pressure, 180 pounds; back pressure, 10 pounds.
1	2	1,200	Belted through two two-hanger shafts to an Enrober No. 386 chocolate dipper.

Candy Manufacturing Data—Sheet No. 2.

Plant "B." This plant, the name of which is withheld, manufactures carmels and taffy principally, although some coated candy is made on order. The company also makes its own packing boxes and decorative paper designs for confectionary stores. There are 75 persons employed. Running hours, per week, 60. Group drive.

Total connected horsepower, 57.5; total number of motors installed, 6; average kilowatt-hours per month, 2,440; load-factor, 7.7 per cent; operating-time load-factor, 16.3 per cent.

Kilowatt-hours, per month, for a period of one year: April, 2,045; May, 2,287; June, 2,852;; July, 2,533 August, 2,692; September, 2,916; October, 3,168; November, 2,419; December, 1,919; January, 2,114; February, 2,147; March, 2,191.

MOTOR INSTALLATION

The following is a list of the motors installed with their respective drives. The supply source is two-phase 220-volt, 60-cycles, and 220-volts, direct-current. The alternating-current motors are of the squirrel-cage induction type and the direct-current is a compound-wound machine.

No.	Horse-power.	Speed	Application.
1	10	1,200	Belted to a two-hanger line shaft and two 20-foot shafts (four hangers each) driving one Goulds No. 4 rotary pressure pump, pumping milk a distance of 32 feet; three chocolate beaters, 26 inches in diameter by 18 inches deep; one 10 by 36-inch chocolate beater with rotating wire paddle.
1	20	1,200	Belted to a two-hanger shaft and a 40-foot shaft (eight hangers), driving 10 Burkhart 25-gallon steam-jacketed cooking kettles; one Howes Eureka 8 by 30-inch cream beater; one Hildreth form-3 taffy puller, operating at 280 revolutions per minute; one 36 by 20-inch revolving coating pan, operating at 450 revolutions per minute; and one caramel cutter, having nine six-inch diameter steel disks on a 20-inch spindle, allowing any desired spacing.
1	5	1,800	Belted to a 20-foot shaft (three hangers), driving two V. Clad 24-inch sizing machines.
			PAPER-BOX DEPARTMENT.
1	7.5	1,200	Belted to a two-hanger shaft and a 60-foot shaft (seven hangers), driving one Knowlton No. 9 end stayer; one 10-inch rip saw; one American 35-inch paper slitter; one Robinson corner cutter; six-inch blades at right angles; one Seybold paper cutter, with 40-inch knife; one Knowlton 46-inch scoring machine; one Hobbs automatic, size 2, ending machine; one 12-inch stamping machine.
2	7.5	225	Compound-would motors, each direct-connected to operating mechanism of a 2,000-pound freight elevator.

Candy manufacturer, name withheld by request. Energy is supplied by The Milwaukee Electric Railway & Light Company, Milwaukee, Wis. Group drive. Running hours, per week, 60.

Total connected horsepower, 45; total number of motors installed, 6; average kilowatt-hours per month, 2,357; load-factor, 9.6 per cent; operating-time load-factor, 20.1 per cent.

Kilowatt-hours, per month, for twelve months; January, 932; February, 869; March, 978; April, 2,251; May, 3,412; June, 3,784; July, 4,513; August, 4,983; September, 2,814; October, 1,807; November, 1,318; December, 832.

MOTOR INSTALLATION.

The following is a list of the motors installed with their prospective drives. All motors are 220-volt, three-phase, 60-cycle machines.

No.	Horsepower	Application
2	2	Direct-connected to two blowers.
1	20	Belted direct to compressor.
1	7.5	Belted to a line shaft, driving one peanut roaster, one peanut crusher, one caramel cutter and one centrifugal pan.
1	10	Belted to line shaft, driving one starch buck, one marshmallow beater and two ice-cream stirrers.
2	3.5	Belted to line shaft, driving five melting kettles.

Summary of Data.

Plant No.	No. of Motors	Total Horsepower	Hours' Per Week	Load-Factor	Operating-Time Load-Factor	Average Kwh. Per Month
I	8	24	42	8.7	26.1	1,143
II	4	15	60	8.8	18.7	723
III	6	57.5	60	7.7	16.3	2,440
IV	5	19.5	60	8.9	18.6	947
V	6	45	60	9.6	20.1	2,357

the manufacture of candy. The building is well adapted to manufacturing purposes and consists of five floors with well lighted basement. This gives the new candy company about 60,000 square feet of floor space and the capacity of the plant is eight million pounds of candy annually.

The plant is electrically equipped with standardized candy-making machinery together with a refrigerating plant. On the upper floors are the enormous copper revolving pans, the chocolate dipping machine, the jacket stir kettles, all motor driven, the motors varying from one and a half horsepower up to ten and fifteen, according to the amount of work required.

All energy for light and power in the Aubuchon-Garneau candy factory is furnished by the Union Electric Light & Power Company. The installation is most modern and consists of direct-current motors with a working equivalent of over 100 horsepower.

Speaking of central-station power in his plant, W. N. Aubuchon, president of the Company said, "we find electric power better and safer than steam power for factory work, especially in a factory like ours, where electric drive means the elimination of overhead shafting and belting, and consequently a cleaner, clearer atmosphere, moreover we are too busy making candy and have no time for the manufacture of electric power to do our work. We prefer to have the central station furnish such light and power as we need and we will stick to the proper manufacture of our own sweet stuff."

Another interesting candy plant using central-station service is located in western Pennsylvania. This company, the name of which is withheld by request, manufactures chocolate creams, marshmallows, gumdrops, etc. There are 45 persons employed 25 of whom are employed in the making of candy and 20 in the packing room. The capacity of this plant is 15,000 pounds per day, the average daily output being 10,000 pounds.

Nineteen and one-half horsepower in shunt-wound motors are installed, the supply source being 220 volts direct current. The following are the features of the motor installation: One five-horsepower, 1,100-revolution-per-minute motor belted to a 50-foot shaft (six hangers), driving one Camden Copper Works steamjacketed cream heater, 28-inch diameter; one Racine Engine Company No. 1½ cream deposit machine; one Racine starch cleaner; one Camden marshmallow beater; one Camden 24-inch caramel heating kettle; one Camden 36-inch revolving coating pan; and one 10-inch steel-disk candy cutter; one three-horsepower, 1,435-revolution-per-minute motor belted to a two-hanger shaft, driving through gears one Thomas Mills 24 by 30 by 18-inch cream beater, and one 12 by 20-inch peanut roaster; one two-horsepower, 1,200-revolution-per-minute motor belted to a Buffalo 30-inch fan, 343 revolutions per minute (draws air into drying room). Also drives from extension on fan shaft, a Buffalo 16-inch fan, operating 700 revolutions per minute; one 7.5-horsepower, 825-revolution-per-minute motor belted to flywheel of a Remington two-ton ice machine. Flywheel, 36 inches in diameter; rim, 7 by 1.5 inches; 136 revolutions per minute. Pressure, 180 pounds; back pressure, 10 pounds; and one two-horsepower, 1,200-revolution-per-minute motor belted through two two-hanger shafts to an Enrober No. 386 chocolate dipper.

The electrical energy consumption per 1,000 pounds of candy made is 4.2 kilowatt-hours; the load-factor is 8.9 per cent and the operating-time load-factor, 18.6 per cent. The plant operates 60 hours per week.

Commercial Practice
Management, Rates, New Business

HANDLING COMPLAINTS IN A LARGE ELECTRIC LIGHT COMPANY.

By E. C. Kimball.

The policy of the Edison Electric Illuminating Company of Boston in handling complaints is always to give the customer the full benefit of its experience, and where there is a question of a doubt grant the customer the full benefit of same. In this paper, which was presented before the Boston Edison Section, N. E. L. A., the author analyzes the company's methods of handling complaints.

In dealing with the subject of this paper, the writer has dealt with it, largely, in a general way, with the exception that where figures have been quoted, or practices followed, they have been taken from the records and experience of the Edison Electric Illuminating Company of Boston.

The relations of a complaint division of a central station with the public should and must be those of an arbitrator, unbiased by that natural prejudice which, unfortunately, is in human nature, almost the universal attitude of us all towards that which is, or apparently has the makings of, an unpleasant situation.

We are all, naturally, in what we consider, or misconsider, our loyalty to our company's interest, prone to believe that the man cannot possibly be right who approaches us with bill in hand, blood in his eye, and with language wholly derogatory to all that we hold inviolate, emanating from his system. Yet that he sometimes is right is proven by the fact that 51 per cent of the complaints made to this company in the twelve months past were analyzed as "complaints warranted."

It is not the intention to convey the impression that all complainants approach us in any such manner. It is true that many so-called complaints are but the endeavor on the part of the customer to familiarize himself with details leading up to his charges, of which, up to the time of his inquiry, he is and must be, wholly ignorant.

The policy of a supplying company should be to always give the customer the full benefit of its experience, and where there is a question of doubt, grant the customer the full benefit of same. In so doing we certainly cannot make a confirmed complainant, and we are almost certain to establish our relations with him upon such a friendly basis as will lead him to "boost" for the company, rather than to "knock" our system every time an opportunity is offered, because we have purposely (apparently) not enabled him to understand it.

Until we stop to consider we do not realize how little knowledge our customers have of the system under which they are supplied with electricity. The common belief, through the association

of the average man with the company, is that an application once made is handled largely by the agent with whom the customer has dealt, and the assumption seems to be that that agent carries the personal relations which he has had with the customer through the various departments, even to the point of having knowledge when the customer is connected to the lines.

This we know is not and cannot be the fact. In many of the larger installations, the agent dealing with the customer naturally has a very close association with all departments of the company handling the various branches of the installation, but the small user (who is numerically in the majority) does not have such an advantage. His application is taken as a matter of detail, and the departments that handle it in the regular course do so as a matter of routine, and until the customer secures his service and receives his first bill, he is largely in the dark as to the exact relations which exist between himself and the company.

We, of course, have asked him to sign an application, and suppose that he has familiarized himself with the details of same. We have further, perhaps, at the time of the installation, sent him our schedule of rates, accompanied by a letter inviting his attention to the various ways in which he may receive the best advantage of his installation, but until such time as a bill is received by him—which in his judgment is greater than he has believed would follow his use of electricity—he, as a matter of fact, pays but very little attention to the details, having made his application largely in the belief that he has at last reached that stage in his upward development where the use of electricity has become a necessity.

The first bill the customer receives that does not compare with what he has been led to believe the service would cost, or with perhaps earlier bills for use during light-load periods, naturally leads to what we at this time erroneously term a complaint. It is now that we have perhaps the best opportunity that will ever offer to make a friend of the customer; or if improperly handled, arouse an enmity that will last during the entire period of our relations with him.

At the time of making the application, the customer has perhaps a hundred other matters in mind relative to other phases of his business, but let him once get the idea that his bill for electricity is excessive, and we can rest assured that we shall have his entire and undivided attention until he is either convinced of the fact that he has judged us wrongly, or otherwise that he has been accorded unjust treatment.

This latter, of course, is the point that our entire attention is given to correcting, or better, obviating in the customer's mind.

The first point in an inquiry to determine the accuracy, or inaccuracy of a charge in question, is naturally that of the meter reading. We, associated in the business, of course appreciate how little real effect an error in the meter reading has in the ultimate charges. The customer, however, has no way of knowing that the record of the meter is a continuous one, and until same is explained he has every reason to suppose such an error results in an excessive cost to him.

In an endeavor to explain this situation fully to the customer, and at the same time familiarize him with the fact that the meter is the real arbiter of his fate, we have adopted the policy, in the early stages of a settlement, to either send or give the customer a meter reading slip on which are represented the dials of a meter without hands, and ask him to mark the relative location of the hands of his meter on it and return to this office for comparison with the records. This, you can readily see, serves the double purpose of securing a check reading, and also familiarizes the customer with the reading of his meter. If we could educate all of our customers to compare the readings of their meters each month, with the readings submitted on the bills, we would soon obviate a very large number of inquiries which arise, and at the same time the customer would acquaint himself with the fact that an over-reading or an under-reading of the meter will eventually effect its own correction.

Assuring ourselves that the reading is not in error, and not being confident in our own minds that the apparently excessive consumption could be accounted for by the use of increased installation, or by reason of the natural increase due to the season, we have necessarily to determine the accuracy of the meter, and here I doubt if we ourselves have a full appreciation of all that is done by the larger companies today to assure the accuracy of this most vital point in our dealings with the customer.

It is to the meter that we must go first, last and always; it is on the record of the meter that we make our final stand in proving, or disproving a claim, and it should always be our aim to convince if possible; if not, to at least arouse enough interest on the part of the customer that he will ascertain from outside sources that it is a fact electricity can and is measured accurately with instruments capable of calibration, to a point of accuracy far beyond that of the more familiar yard stick or quart measure, whose inaccuracies we accept more readily through long association.

We still have the customer who says "I don't care a —— what the meter shows." He is perhaps one whose opinion becomes biased by reason of his experience with the old chemical meter, and has possibly at some time paid at the rate of 20 cents per kilowatt-hour for the abrasions incident to the travel of the plates, so we must handle him tenderly, and re-educate him to the present-day conditions, assuring him, if necessary, that the Commonwealth of Massachusetts stands ready to guarantee the accuracy of the meter provided that he desires to pay for the test. Show him that out of the total number of meters installed on the lines of the Edison Company, 36,650 were tested in the past twelve months, the average error of which, at full load, was less than two-per-cent slow, and at light load less than five-per-cent slow.

I would emphasize the fact that the average error at both points of the test is one of under-registration. In complaint tests—of which we made last year 1,150—we found but 162 cases where the error was over five-per cent on either light or full load, and but three per cent of our allowances for the year were made on account of meter error, in spite of the fact that it is our practice to make an adjustment of all errors on the basis of the maximum, whether it be found at the full-load or the light-load point of the test, allowing the percentage of error for one-half of the kilowatt-hour consumption since the previous test.

It must be admitted that the meter is mechanical, and like the human, liable to err, but in view of the above figures we can, until it is proven otherwise, in the case under advisement, always maintain our position of absolute belief in the general accuracy of our meters as a whole. Show the customer that the fast meter is positively the exception, possibly due to excessive overload occasioned by short-circuits, and he will in the future call our attention to a condition with a knowledge on his part that will assist him to an appreciation of our findings.

We must not feel that it is altogether a bad thing for the customer to find a fast meter once in a while, for if we had no occasion to show how liberally we deal with such a case we would have nothing to brag about to the 90 per cent of the customers who get nothing as a result of the test, by reason of meter proving to be correct.

Having assured ourselves that both the reading and the meter are correct,

we have practically solved the question of the culpability of the company with some exceptions, such as a possibility of an improper connection of the ground wire through the fields of the meter; or the possibility of load being connected through the meter other than that intended, which is not a fault of the company.

We do find the latter point has in some instances presented the solution of a most vexing question, and we should at all times make any investigation possible in tracing out wiring to determine the possibility of such an error.

There is also in the office and apartment building the possibility at times of a condition of series metering. This has occurred in buildings where the wiring all comes to one meter board, and while not a common cause of complaint, it is always worth consideration.

We must assume that the agent handling a complaint will advance the argument given us by a comparison of the weather chart, by which we show the increase or decrease of cloudy weather from month to month. It is true, of course, that this explanation is effective under certain conditions, and would always be good if it were not, unfortunately from our standpoint, a fact that the weather conditions in a given month sometimes improve over those of the previous year. This is, of course, but a means to find a possible explanation to satisfy a customer.

After the most assiduous complaint man has exhausted all possible means to prove his company is not at fault, he is not yet allowed the privilege of dropping the matter, but must continue on through the fields of sin, both of commission and omission perpetrated on the customer not only by the contractor, who has made the original installation, but many times through the customer's own perverted ideas of what constitutes a proper method of illumination, or perhaps (we only suggest it) improper information from the agent at the time of installation.

We here open up fields illimitable in reaching the good graces of the customer, and while it is true that we have given the high-efficiency units of illumination the widest possible publicity, there are yet those who have not taken full advantage of their opportunities, either through a mistaken sense of economy of the "penny wise" type; or again, strange as it seems to us through lack of knowledge of the savings made possible by the Mazda lamp.

We can many times show the customer that the result of his complaint is productive of good in spite of the fact that we have not been able to make an adjustment of the bill in question on account of meter error. This practice we have widely applied with most gratifying results. I would quote, as an example, a case where one of our largest retail grocers was about to go over to our competitors because a rate could not be made that he felt would fit his conditions of short-hour burning. He, unfortunately, was one who had in previous years been favored in his rate under the old quantity discount system, which at the time of standardization of his rate resulted in a very material increase in his net bills. The original complaint was adjusted before the days of the tungsten lamp, his installation being made up in part of 3.1-watt per candle, carbon-filament lamps, with the larger open spaces illuminated by means of 550-watt arc lamps. A complete readjustment of his installation was effected through the use of the large-unit Gem lamp, installed with a proper type of Holophane reflectors. This readjustment resulted in a reduction from 18 kilowatts of connected load to 9 kilowatts and at the time of the exploiting of the 100-watt Mazda lamp, this customer was induced to change his reflectors to the bowl type, and install the 100-watt high-efficiency unit in place of the 250-watt lamps, effecting by this means a further economy of 4.5 kilowatts, making a net saving of 75 per cent over the original installation.

These changes have not only resulted in a great economy to the customer, but have also resulted in a much longer hour use on his part, with a consequently brighter and more cheerful store.

In a word, it is not enough to prove our own righteousness, but we must, if possible, find a way to convince the customer that we appreciate the fact that his interests are ours, and wherever it is possible for us to show that he is not receiving the full benefit of the use of the electricity for which he is being charged, not only in the application of his lighting, but in the application of his power, it is well within the province of the complaint division to set the customer right.

We have so far only considered the class of complainant that comes under possible errors of meter or installation. We have yet to consider that class that fall under the rate consideration. Any central-station company selling under retail and wholesale conditions must have a point where the agent in soliciting the business will be unable to determine the most advantageous rate for the customer, and it follows that sometimes the question will naturally arise as to whether one or the other is correct.

Our policy is and has been to always give the customer the advantage of the best rate under our schedules, and where we discover that he has not been securing the benefits of such rate, we apply it not only to future business, but make it retroactive in the case of yearly contracts, for a period of three months, making allowance for the difference.

That such is a considerable item of the work of the complaint division is shown by the fact that 62.5 per cent of the total allowance made in the past 12 months was on account of change of rate.

In relation to this question of rate, there is a further adjustment made automatically each year by the auditing department of every customer's account, and where an amount has been paid in excess of the maximum rate of 11 cents a kilowatt-hour, which is the rate today (10 cents after March 1) a credit is given the customer for the difference, provided the minimum amount is not less than $12 a year.

It might prove of interest here, to give a slight synopsis of the past 12 months' records of our complaint division.

We received in the 12 months just past a total of 5,350 complaints. These complaints we divide into two great classes: "Complaints warranted" and "Complaints unwarranted." Under the classification of complaints warranted, we sub-divide into eight divisions, as: Apparatus Rental Cancelled; Change of Rate; Adjustment of Fixed Charges; Settled by Explanation; Fast Meter or Indicator; Minimum Cancelled; Violated Contract Charge Cancelled; or Miscellaneous.

Under these divisions of "Complaints Warranted" 2,700 of our total last year were analyzed, and 96 per cent of all allowances made in the year by the "Complaint Division" were here classified.

Under the second great division "Complaints Unwarranted," we make two sub-divisions, viz.: "Unwarranted, New Complaint," and "Unwarranted, Old Complaint;" each division being again sub-divided as "Customer Convinced," and "Customer Unconvinced," each of which are again divided into ten classes.

Under our analysis of "Customer Convinced," where the complaints were unwarranted, we analyzed 2,600 of our total of 5,350, and under the classification of "Customer Unconvinced" we have 50 complaints, in all of which cases an allowance was made to the customer, the sum of which allowances amounted to four per cent of our total and the allowance was classified as being made for the purpose of satisfying, it being known in fact under the heading "Allowance to Satisfy."

In all of these latter cases we have been absolutely convinced by our investigation that there is no basis on which a possible complaint could be warranted by the conditions found, and, yet we were unable, either by argument or by a submission of fact, to convince the customer that his complaint was not a correct one. To effect a settlement we have in all cases met the customer on his own ground, and in point of fact have allowed him to settle his own complaint with the company, making an adjustment only when the customer has satisfied himself, as well as the party handling the complaint for the company, that the matter is adjusted to his full satisfaction. The criticism of this policy might be that it will produce a class of customers that continually expect some allowance on the mere suspicion of error. The best answer, however, to this is that, having been the policy of our company for a number of years to give a new complainant full benefit of the doubt, an analysis of our figures does not show such to be the case.

It is, of course, true that we are obliged to handle a great part of our complaint business by letter. We test the customer's meter or make such other investigation as the conditions require, find no error and so inform him by mail. In our letter we always invite him to come back in the event of his not accepting our statement as a full explanation, or as a satisfactory answer to his complaint. We must assume on not receiving any further communication from him that he has, by this means, been satisfied of the accuracy of our findings.

A full knowledge of the fact that it is the intention of the supplying company to grant the customer the advantage of the best rates which they have to offer, accompanied by the further knowledge that today they are doing business under an absolutely standard schedule, which is in all cases applied to similar conditions, will, I feel, tend to raise the degree of confidence with which the public meets the representative of the central station.

This, with the endeavor to meet all complaints courteously and with unfailing good nature on the part of the people selected for this work, will eventually break down that feeling of lack of the personal equation which has seemed to come into the dealings of the public with the corporations.

I feel that I can state it as fact there is no closer personal attention given to any question governing the sale and use of any commodity than we are today giving that of a complaint of electric service.

If it is a complaint of poor service, or low voltage, trained engineers investigate it; if a complaint of bill, there are people who devote their entire time to an analysis of the conditions leading up to and involved in the determining factors of the charge, readings are checked, meters are tested under the supervision of not only practical but technical meter engineers; wiring is traced out for all possible errors. The rate question is investigated and comparisons made to determine the best possible rate under the schedule. Illuminating engineers are called on to determine the question of illumination produced as related to possible illumination for the energy expended; power experts are detailed for the purpose of giving the customer the best available opinion as to the adaptation of electric power to his individual needs, in fact more is done for the customer than he could think of doing for himself, or even have done for him, if he went into the market to engage the services of outside engineers; and then, where it is possible for the central station to find an error of meter registration, of rate, or of engineering, correction is made fully and freely.

We, of course, have finally to give some consideration to the chronic complainant. He is the fellow who always has some question of principle involving the ethics that must be applied to the relations between the public and the corporation. It is true that we have some few people in every community whose whole interest is involved in the question of principle, but the complaint man of the central station rarely comes in contact with them, and where it is possible for us to find in the complaint of such a man that there is some slight consideration due him, either in the matter of rate, or through some discovery of error, the fact that there is monetary gain in sight, will easily overshadow the question of principle, provided always that we must convey to the customer it is not by reason of his views, but rather by reason of fact that we offer same to him. The complaints of the chronic type where we find no error fall at once in the classification of the "To Satisfy," and thereafter by a peculiar circumstance of terminology in the case of the Boston Edison Company, in the U. B. D. class which is not what might be interpreted but means "Unwarranted," "Old Complainant," not satisfied.

In conjunction with the chronic complainant we sometimes come in contact with the aggravated form of the disease which produces what is commonly known as the "trust-buster," but as the public becomes educated to the fact that a corporation great enough to supply their electrical needs in such a territory as this, must of necessity be officered by men broad enough to appreciate the advantages of a policy which will tend to conciliate rather than to aggravate, then will the relations between the complainant and the complaint man be confined entirely to the questions actually at issue, unprejudiced and uninspired by the advertising campaign of some philanthropist, seeking to tear down all that is, with nothing to offer as an alternative. He is the real bane of the complaint man for the inaccuracies of his statements crop up not once but a hundred times, if he be a good advertiser. Yet in spite of him we have at hand the means of his undoing, for it is invariably true that his arguments will not stand the bright light of fact and the policy of published schedules, adhered to; non-discriminatory treatment of an invariably courteous nature, and a disposition to furnish accurate information fully and freely.

Power Business in Louisville.

Gratifying strides are being made by the Louisville Lighting Company, of Louisville, Ky., in securing new business, particularly power business although an increase of 100 per cent has been made in residence business secured during the months of November and December, 1911, as compared with the same months in 1910.

One of the large industrial establishments abandoning an isolated plant in favor of central-station service is the Kentucky Public Elevator Company, doing an extensive grain drying and elevator business. This company recently entered into a contract with the Louisville Lighting Company for 165 horsepower in motors which is but one half of the ultimate installation. Individual drive will be used throughout. The Globe Casket Company and Bridgeford & Company, stove manufacturers, also have contracted for service the former for 140 horsepower and the latter 130 horsepower.

Toledo Advertising.

The Toledo Railways & Light Company has inaugurated a newspaper-advertising campaign for the purpose of making patrons acquainted with general conditions which they should know. The company has also asked the Board of Education to permit the distribution of cards among school children explaining to them how they can avoid accidents by care.

Rates Cut in New Orleans.

The New Orleans Railway & Light Company has announced a cut of about 30 per cent in its power rate to wholesale consumers, to take effect March 1. It is hoped by the interests of that city that this will stimulate manufacturing activity and halt the decline which has recently been evident.

Electrical Construction

NOTES ON ELECTRICAL CONSTRUCTION.

By George J. Kirchgasser.

This is the tenth of a series of articles on electrical construction. The matter is treated in a thoroughly practical manner, and covers every phase of construction usually encountered by the electrical contractor or the electrician in an industrial plant. This article discusses in detail the wiring of motors.

Electric Motors.

A dynamo or generator has its armature or its field revolved by mechanical means. The conductors pass through the magnetic field, and the result is the generation of electric current. A motor has the same general appearance and the same parts as a dynamo, but current is passed through the armature conductors at right angles to the magnetic lines which pass from field pole to pole. The conductors tend to move away, which is motor action. A motor does mechanical work by being supplied with electric current. The generator is driven and produces current. A motor drives other machinery. The electrical energy transmitted to a motor in changing to mechanical energy involves, of course, several losses such as bearing friction, waste currents set up in the iron of the armature and resistance losses in the windings of the motor.

The armature of a motor revolves in a magnetic field just as in the case of a dynamo; and, therefore, a voltage is set up in its conductors. This voltage, known as counter electromotive force, opposes the current being supplied to the motor armature and varies in strength according to the speed; that is, according to the rate that the conductors cut through the lines of force which pass from field pole to field pole.

When a generator is being started it will be noted that the voltmeter indicates a low voltage, but that the needle gradually moves toward the rated voltage as the speed increases. A similar condition exists in the motor. When the motor is starting and the conductors of the armature are revolving slowly, the value of the counter electromotive force generated is very low, but when the motor speeds up, this increases. At full speed this back pressure nearly equals the supply-line voltage, the difference between the two representing that necessary to send the working current through the motor.

Counter electromotive force checks the flow of current and as this is not present when a motor is started, as explained above, it is necessary to provide a motor with a starting rheostat, or controlling device, several types of which are illustrated in Figs. 1 to 3. The ordinary starting rheostat for direct-current motors throws resistance in series with the armature (See Figs. 6 and 9), and thus cuts down the current supplied the armature and permits of proper starting. The rheostat is so arranged that successive steps of resistance may be cut out as the speed increases and as the motor thereby produces a counter electromotive force sufficient to aid in checking the incoming current. At full speed no protective resistance is required. The usual time for cutting out the resistance is 15 to 20 seconds, although for some classes of motor application it is necessary to provide starters with heavier, "one-minute duty" resistance. The resistance of a starter should be cut out as soon as possible, using care however to keep down excessive current inrushes.

When a motor starts, the current in the motor conductors (without starting rheostat) may be approximately calculated by Ohm's law; that is, the current is approximately equal to the applied voltage divided by the armature resistance. Thus, consider a 110-volt shunt motor having an armature and brush resistance of 0.8 ohm. At standstill the armature current would be 137.5 amperes, as may be seen by dividing 110 by 0.8. At full speed, however, there would be a counter electromotive force of, say, 106 volts, and hence the strength of the current would be found by dividing the difference between 110 and 106 by 0.8; that is, the current would be 5 amperes. At say 66 volts counter electromotive force, the armature current would 55 amperes.

The discussion in the last paragraph serves to emphasize further the necessity of the use of rheostats in starting direct-current motors. The rheostats are so connected, in the case of the shunt motor, that the circuit to the field windings are closed first. This is necessary so that the field poles will be magnetized so as to insure the generation of counter electromotive force as soon as the motor starts, which has been seen to be so important. Also, full torque is only possible when the field is magnetized, field flux being one of the components affecting torque.

For alternating-current motors, primary-resistance starters, secondary-resistance starters and auto-transformer starters, or compensators, are used. These will be described later.

The direct-current motors found in every-day use include shunt, compound

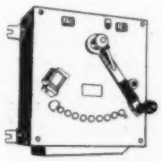


Fig. 1.—Starting Rheostat.

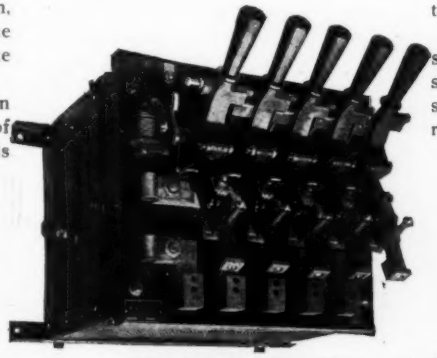


Fig. 2.—Multiple-Switch Type of Starter for Large Motor.

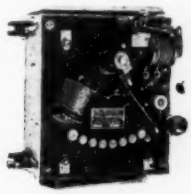


Fig. 3.—Another Type of Starting Rheostat.

and series-wound machines. Single-phase, two-phase and three-phase squirrel-cage, and two-phase and three-phase wound-rotor or slip-ring type motors are those most commonly used on alternating-current circuits. Synchronous alternating-current motors have not been used to a very great extent outside of central stations and substations. They can be used, however, for driving certain kinds of constant-speed machinery, such as a generator, where small starting torque is required or where means for starting are provided. By adjusting the field strength of a synchronous motor the power-factor of the system on which it is operating can be affected. A strong field will improve the power factor, thus compensating for the lagging currents caused by a large induction-motor load.

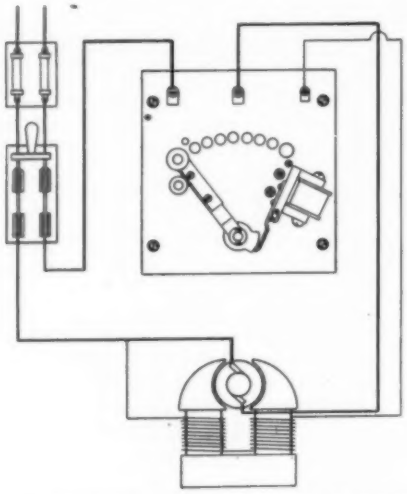


Fig. 4.—Diagram of Connections for Speed Regulator.

Most direct-current motors found in manufacturing and industrial plants are low voltage machines (below 550 volts) and the use of the shunt type operating at constant speed is most common. Shunt motors when running a short time increase their speed a trifle due the heating of the field windings. The heating increases the resistance, allows less current to flow and in the field and therefore weakens the field magnetism. This raises the armature speed, but once at this speed there is practically no change even with variations in load. The starting torque is good. The connections for a four-pole shunt motor are shown in Fig. 9.

The speed of the ordinary shunt motor can be increased somewhat above normal, about 10 to 20 or 25 per cent, but trouble due to sparking at the brushes will result if the increase is very much in excess of normal. By means of a regulating rheostat, Fig. 5, connected in the armature circuit as shown in Fig. 4, the speed of the motor can be reduced below normal, through various steps. The resistance inserted in the armature circuit in this way varies the voltage impressed on the armature of the motor. The resistance in this type of regulating device is designed to carry the entire current at all times and this system therefore is wasteful of energy.

Fig. 5.—Motor Speed Regulator.

As mentioned above the speed is changed, because the voltage applied to the armature is changed. This voltage is changed by varying the drop in the resistance. The energy dissipated—equal to the square of the current times the resistance—depends upon the current. If the motor is running light and not demanding much current, the speed reduction will not be the same as when the motor is running loaded. The current is a component which effects the voltage drop in the resistance and, therefore, the variations in speed. If the load on the motor varies—which causes variation in current—the speed will vary. Speed reduction by armature resistance, therefore, has the two objections; variation in speed with load, and, the wasting of energy when running at speeds below normal. But a standard constant-speed motor can be used and a simple rheostat and where the motor speed is reduced only occasionally, this method is satisfactory. Motors driving ventilating fans, blowers, etc., can be satisfactorily regulated by the armature-resistance method, as the torque required at lower speeds is less than at normal and, therefore, the amount of energy wasted in the rheostat is reduced to a minimum.

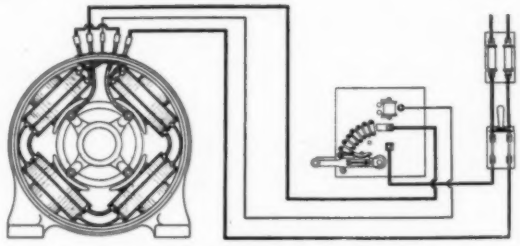


Fig. 6.—Circuits of Motor Starter.

Fig. 7.—Typical Controller for Series Motors.

Increasing the speed of a motor above normal by inserting resistance in the shunt field covers the most general of variable-speed applications. Included in this class are all the so-called motor-driven machine tools, such as lathes, drill presses, shapers, planers, boring mills, and wood-working machines. Adjustable-speed motors of proper design and with the correct controller for varying the current in the shunt field will give various numbers of selective speeds above normal and will maintain a constant speed at the various points without any trouble at the brushes. A two to one variation, which is 100 per cent increase above normal, is used to a considerable extent.

By inserting resistance in the shunt field of the motor, the magnetic field poles are weakened because of decrease of current flowing in the pole windings and the armature of the motor revolves faster to generate the proper counter electromotive force. All the current taken from the line is utilized for power; no energy is wasted.

Combinations of the armature-resistance method of speed reduction and shunt field-weakening of speed increase are sometimes employed. This can easily be accomplished by providing the proper controlling regulator. This often makes possible the covering of a wide range of speeds with a standard constant-speed motor.

Where it is required to get speed ratios of three to one, four to one, etc.,

a shunt motor having commutating poles or interpoles is adapted. Where great speed variations are required the motor is of larger size than for constant speed specially designed motors being required. Weakening the field for purposes of speed control above normal speed can only be carried to a certain point. The additional poles are connected in series with the armature, and prevent sparking. This allows changing the magnetism of the field poles through a greater range than with the ordinary motor design.

For motors driving machine-shop lathes, mills, etc., field control is suited, as in most of these cases the torque is constant or is greater at lower speeds.

The shunt motor is therefore used where the speed and load are fairly steady, as for group machine driving, and where considerable range of speed is desired.

The Stow, Reliance and Lincoln types of variable-speed motors vary the speed by shifting the armature or the field poles so as to change the air gap.

Compound-Wound Motors.

The compound-wound motor is like the shunt motor except that a few coils

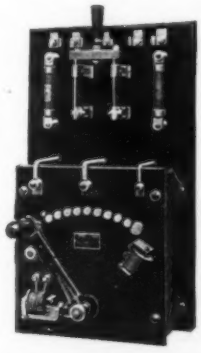


Fig. 8.—Motor Switch and Starting Rheostat—No-Voltage and Overload Release on Rheostat.

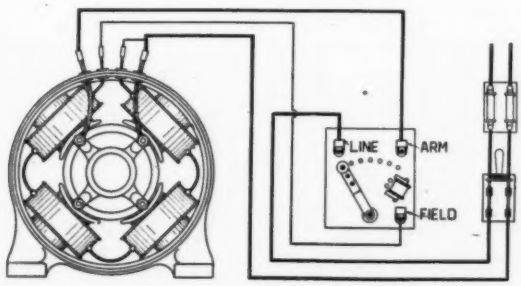


Fig. 9.—Switch and Rheostat Connections for Shunt Motor.

of a winding in series with the armature are placed on the field poles in addition to the shunt winding, as indicated in the diagram, Fig. 6. The series field, since it receives the full armature current, strengthens the field magnetism at starting and provides an especially good starting effort. In some classes of service, as in elevator work, the series field is cut out automatically by means of the controller as soon as the motor has come up to speed.

If the series coil of a compound-wound motor is connected so as to oppose the action of the current in the shunt windings, the field poles will be weakened when the load increases and any tendency to drop slightly in speed will be counteracted by the speed-increasing effect of the field weakening. For very fine work, as weaving or other textile application, it is possible by this method to provide absolutely constant speed.

Because compound-wound motors respond to momentary widely varying loads of short duration, they are well suited for driving reversing planers, punch presses, slotters, shearing machines, boring tools, bending machines, gear cutters, drop hammers, shapers, and similar appliances.

Meeting of the Electrical Committee of the National Fire Protection Association.

The Electrical Committee of the National Fire Protection Association will meet in Boston on March 27. This committee, which is one of the most important of the Association, consists of the following members: Farley Osgood, Newark, N. J.; Martin Schreiber, Newark, N. J. E. McCleary, Detroit, Mich.; J. E. Cole, Boston; W. H. Blood, Jr., Boston; W. S. Boyd, Chicago; G. E. Bruen, New York; Washington Devereux, Philadelphia; J. G. Forsyth, New York; C. M. Goddard, Boston; C. H. Hill, Philadelphia; H. O. Lacount, Boston; Charles Lum, New York; A. M. Padden, Syracuse, N. Y.; Dana Pierce, Chicago; A. M. Schoen, Atlanta, Ga.; H. P. Strong, New Orleans; V. H. Tousley, Chicago.

Among the Contractors.

An electrical establishment organized on lines somewhat unusual is the Machinists' Electric Company, of Topeka, Kans. This company was incorporated five years ago by six men, five of whom are skilled mechanics, who conceived the idea of a general contracting and repair business, conducted on a co-operative plan. The result during the past five years has been a harmoniously operated business which has prospered steadily. Each stockholder is actively engaged in the business and each one therefore retains his original interest in its welfare.

LETTER TO THE EDITOR.

Heating Devices on Lighting Circuits.

To the Editor;

There are a number of heating devices on the market which are approved. These devices in a great many cases require as much and even more than 660 watts. Now in most cases they are supplied with an ordinary attachment plug for use in any of the sockets about a home. If these devices are used on the lighting circuits, then it is evident that it is necessary to fuse up the circuit heavy enough to carry the heating device and also the lamps. If they are not to be used on the lighting circuits, then why not require the manufacturers to supply plugs which will not fit an Edison socket, thus making it necessary that new wiring be put in? What is your suggestion along this line?

Referring to circuit-breakers, where circuit-breakers are provided for three-phase circuits as well as other circuits, the overload tripping coil is usually left out of one leg of the circuit. Now suppose that on two different circuits the leg which does not go through any tripping coil should become grounded, and it happens that these two legs are of opposite polarity, then we have a short-circuit and no protection. Why do not the rules require a coil on each leg? It is very probable that the circuit will not be tested so as to make it certain that in all cases the same polarity of each circuit will be the one that has no coil.

FRED CLAYTON.

Fullerton, La., February 27, 1912.

Electric Horse Clipping.

Last year a local liveryman with an electric horse-clipper rented a spare storage battery which we had and, going from house to house among private horse owners, made twice the cost of the new battery which he starts out with this spring.

Any private horse owner knows the nuisance of long, loose horsehairs floating around when the spring "shedding" begins, and while he often wishes his horse clipped, he does not know whom to get and has not the time to look into the matter.

This is a live side line for any live contractor who has a liveryman friend. Perhaps the liveryman has not yet gotten an electric clipper, so there lies the first possibility.

G. W. Barlow.

An innovation along the lines of electric signs has been adopted by the St. Louis *Times*. One of the big automobiles used by the paper carries, at night, an electric sign operated by a storage battery.

MOTOR DRIVE IN SEWING-MACHINE FACTORY.

By Guy R. Grove.

An excellent example of a complete and up-to-date motor-drive installation for a medium-sized manufacturing establishment is that of Folley and Williams, manufacturers of "Domestic" sewing machines. Electricity is used throughout the factory for power and light and at present there are a total of 175 motors ranging in size from 0.25 to 30 horsepower. These motors are placed indiscriminately throughout the factory and aggregate 249 horsepower.

In planning this motor installation the machines were all arranged on the shop floor to be driven either individually or in groups, whichever happened to be the most economical. A machine shop of this kind is classed as a light manufacturing establishment making the same products continually, and machines used in it were purchased or designed to do just one thing, or one class of work. After they are properly adjusted for the character of material to be worked and for the cutters, no changes in the power required to drive them is necessary until better methods or facilities are developed.

The problem of drive was therefore simple enough as a motor drive with constant speed, and adequate power was about all that was required. In this plant there are a great number of machines doing the same work all day and requiring practically the same power and in nearly all instances constant speed. These machines were therefore placed together and driven in groups of eight or ten by an overhead line shaft belted to a motor of sufficient size suspended from the ceiling.

Machines for intermittent work, such as drill-presses, emery wheels, wood saws, planers, milling machines and special machines which were required to run only part of the day in order to turn out their share of the work, are all driven by individual motors belted direct to the machine. These motors are all suspended from the ceiling, and range in size from 0.25 to 30 horsepower, as the nature of the work is such that no larger motors are required.

The machines driven by individual motors are placed in the most convenient places so as to be as near as possible to the machine whose operation they follow in order to eliminate the handling of parts in their various operations.

Practically all the motors have a speed of 1,700 revolutions per minute, and all are started without any form of starter or controller, except the ten and thirty-horsepower motors.

The machine shop is 125 feet wide and 300 feet long and one story high with a brick wall and frame roof. The roof is well provided with skylights so that artificial lights are not necessary even on cloudy days, except on fine detail work.

All the motors used throughout the shop are Westinghouse three-phase 220-volt and of the squirrel-cage type.

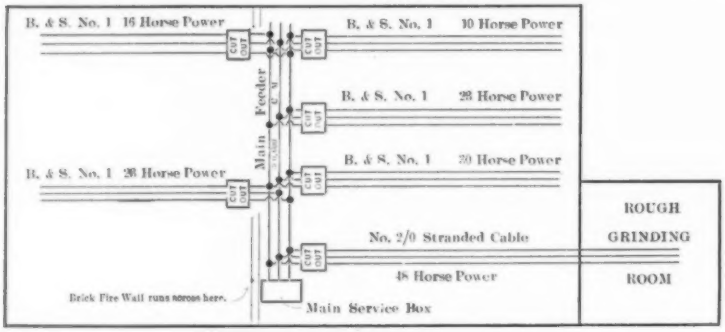

B. & S. No. 1 16 Horse Power
B. & S. No. 1 10 Horse Power
B. & S. No. 1 28 Horse Power
B. & S. No. 1 20 Horse Power
B. & S. No. 1 20 Horse Power
Feeder
Main
No. 2/0 Stranded Cable
48 Horse Power
Brick Fire Wall runs across here.
Main Service Box
ROUGH GRINDING ROOM

Fig. 1.—Wiring Diagram.

Following is the number and sizes of motors used:

No. in use.	Horse-power.	Used for.
21	0.25	Small drills, emery wheels and lathes.
60	0.5	Drill presses, emery wheels, screw machines, small planers, lathes.
33	1	Larger drills and emery wheels, planers and milling machines, lathes, group drive for testing finished machines.
20	2	Gang drills, large emery wheels, wood saws, taping machines and turning lathes, and miscellaneous machines.
7	3	Forge blowers, punch presses, planers.
16	5	Group drive for lathes and grinders, motor-generator sets for plating.
1	10	Group drive for ten screw machines.
1	30	Five large emery wheels for rough grinding, four tumblers for cleaning castings.

Wiring.

All the wiring is open work. Knobs and cleats are used for the power circuits and knobs and tubes for the lighting. The power circuits are supported on the roof trusses by cleats. Fig. 1 shows a layout of the factory and the power feeder circuits. Care was taken however, in allowing plenty of current-carrying capacity for the circuits for more motors, when it is necessary to install them.

The service is supplied by the Public Service Company of Northern Illinois, by high-tension transformers located just outside of the building and near the service box. The voltage is stepped down to 220 volts for the motors. A 25-kilowatt transformer is also located here for supplying 110 and 220-volt three-wire service to 1,100 lights used throughout the factory. The service box for the power and lights can be seen in the background

Fig. 2.—Motors Driving Individual Drill Presses.

in Fig 3, and also contain the meters and current transformers.

The main feeder, running across the shop, is a stranded cable of 300,000 circular mils and a current-carrying capacity of 350 amperes. The cable is secured to the brick fire wall by large porcelain knobs fastened to a wooden support. This feeder can be seen in the background in Fig. 2. The branch feeders are taken off of this main feeder as shown in Fig. 1. These feeders are provided with a switch and cartridge fuses which are placed in an iron box at the point where they leave the main feeder. The switches are placed where they can be reached from the floor. The connected load on each one is given in Fig. 1.

With but few exceptions the motors are hung on the ceiling trusses, either below or on one side. The trusses, of course, are reinforced to support the motors. Fig. 2 shows a row of motors for driving individual gang-drill presses, and are mounted on the side of the truss. The sizes shown here range from 0.5 to 2 horsepower. Most of these drills are operated continually, but a few of them are only used for special machines and consequently used but part of the time.

The feeder for this string of motors is run on cleats on the opposite side of the truss from the motors and is made up of No. 1 solid wire. Taps are taken off the feeder as near as possible to the motor it is to feed and run underneath the truss up the side the motor is on through fuses and a single-throw switch and to the motor. These motors are all started by throwing them straight across the line and the switches are operated by attaching a small-sized chain to the handle and the leverage so arranged by suitable pulleys so the switch can be opened or closed by the operator on the floor pulling one of the two chains.

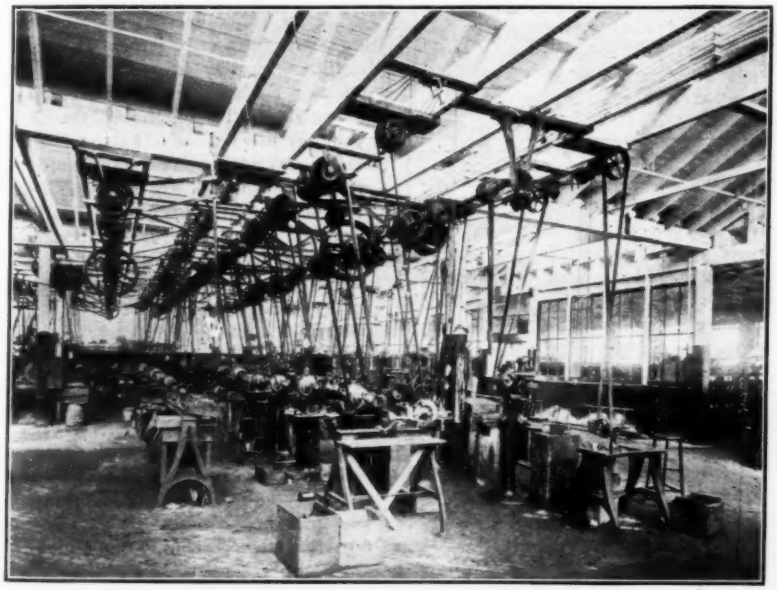


Fig. 4.—Motors for Group Drive.

Fig. 4 shows a section where group drive is employed. These machines are all doing about the same class of work and require a continual constant power. In this group there are three long line shafts and the counter schafts are used in speed changing and each shaft is driven by a five-horsepower motor running at a speed of 1,700 revolutions per minute. The motors are belted direct to a large pulley on the line shaft of such diameter that the line shaft is driven at 300 revolutions per minute. These five-horsepower motors are also mounted on the ceiling. The switches controlling them, however, are placed on a post in reach from the floor and are mounted in iron boxes. One of these motors is partly visible just behind the first pulley on the line shaft to the left of Fig. 4.

Fig. 3.—Motors in Sewing-Machine Factory.

Fig. 3 shows a section of motors which are all suspended from the ceiling. Most of the motors shown here are 0.25 or 0.5 horsepower and are used for very small drills and special light machinery. These motors are also started and stopped by switches suspended from the ceiling on wooden supports near the motors they control. These switches can be seen in Fig. 2. The No. 00 feeder for the 30-horsepower motor can be seen in Fig. 3 to the left on the ceiling. The small motors here are also fed from this circuit.

The largest motor used is a 30-horsepower motor in the rough casting room. It is belted to a line shaft which drives five 10-inch emery wheels and four one-ton tumblers for cleaning castings. This motor is suspended from the ceiling and inclosed in a dust-proof box.

Two five-horsepower motors are used for motor-generator sets for electroplating work in the plating room. These sets generate direct current at a pressure of six volts and are rated at 350 amperes each.

Ten small screw machines are driven in groups by one ten-horsepower motor.

While the total connected load is 249 horsepower the maximum demand is about 160 horsepower.

The lighting is done with sixteen-candlepower carbon lamps for detail work and five-lamp, 60-watt tungsten clusters for general illumination for stock and assembling rooms. The five-lamp

clusters are used with a 24-inch enameled reflector which is suspended fourteen feet from the floor and the clusters equally spaced over the floor area to be lighted on the basis of an energy consumption of 0.45 watts per square foot in the building. The lamp circuits are grouped in panel boxes on the side walls, which are connected through branch mains to the regular distributing main nearest the box. These branch mains are connected to the distributing mains through cutouts in iron boxes. For detail lighting the carbon lamps are hung from the ceiling by drop cords and one or two used at each machine.

This motor installation is an unusually interesting one in that it shows the headway being made towards individual motor drive, and the use of squirrel-cage, constant-speed induction motors for machine shops. Of the total number of 175 motors in active service in this factory, only 18 motors are used for group drive.

As the majority of the machines used here are either machines made especially for the manufacturing of sewing machines requiring constant power and speed, or machines used for intermittent work, the individual drive is highly desirable as it is more economical and eliminates hundreds of feet of shafting and belts, which in a shop of this kind would have to be placed overhead thereby cutting off a great part of the light from the roof which is absolutely necessary in doing such fine machine work as is required here.

The output of the plant during the busy season is about 5,000 machines per month, and the monthly power consumption is 20,000 kilowatt-hours, making a consumption of 4 kilowatt-hours for each machine manufactured.

FROM A CONTRACTOR'S NOTE-BOOK.

Arranging Concealed Conduit.

The majority of the wiring plans which are prepared for buildings in which the wiring is carried out in concealed conduit when examined give the impression that the tubing can be, or has been, laid in a hap-hazard manner, picking up from one light or switch to another, and running in any direction which would enable a small saving to be effected by reducing the amount of tube and conductor necessary. The usual plan shows conduit fixed under or between floors, crossing girders or going through stone or concrete walls as the case may be, but usually the impression is only given because the plans have been hurriedly or inaccurately drawn. In all high-class installations there are certain general rules for running conduit. When it is laid under floors it is installed in a manner best adapted to or suited for the particular kind of flooring. The modern custom is to run it in straight lines, parallel with the walls of the building. Ordinarily, all horizontal runs of tubing are placed under floorings whether in rooms or passages. Horizontal runs are seldom if ever placed in walls or partitions. Upright runs, on the other hand, can only be placed in such positions. The modern custom is also to limit the number of bends from one draw-in point to another to four, not including those at the ends of the run. Orthodox fittings should always be used and only in cases of absolute necessity should such fittings as long or specially angled bends other than those supplied by the conduit maker, be allowed. There are cases, of course, where some sort of "set" has to be put in a length of conduit to allow it to follow some special line in the building, but where possible such deflections from the straight should be made by means of a pull-box or draw-in box. The conduit must be clamped to the wall or floor joists with proper pipe hooks, or conduit clamps and not in a rough and ready manner by means of cut nails as is frequently done. Where the draw-in system is to be adopted, the conduit must be firmly fixed and if necessary guyed or anchored in position to withstand the strain of drawing in the conductors.

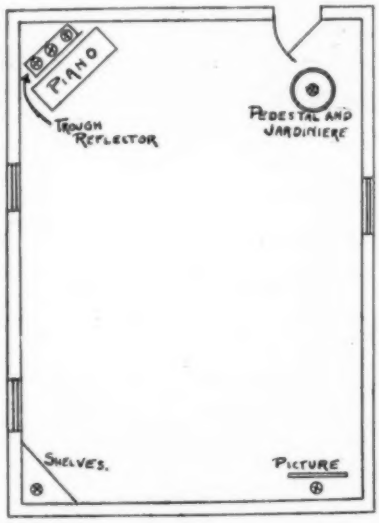


Fig. 1.—Indirect Lighting of Parlor.

As fires have been caused by electrical fixtures and wiring that have been deranged or damaged by previous fires in the same buildings underwriters are advising that after every partial loss in a building in which electricity is used for lighting, or power, or both, all wiring and controlling devices be inspected carefully by a competent person before the equipment is used again.

AN ODD SYSTEM OF LIGHTING.

By D. McKellin.

A man whose daily work consists largely of wiring buildings for electric lighting naturally has ample opportunity for making investigations as to the effectiveness of various schemes of illumination. Thus it happens that in the home of the wireman one will often find an arrangement of lighting units which is really remarkable both for its efficiency and its uniqueness. An installation of the kind recently came to the writer's notice while he was visiting at the home of an acquaintance of his who is a practical electrician. The installation in question, though small, is well worth description.

This is a sort of system of indirect illumination for lighting a parlor. The room is about 20 feet square and has a ceiling 10 feet high. A piano occupies one corner of the room, as is indicated in the accompanying figure, and behind this a trough reflector is installed in which there are three 25-watt tungsten lamps. The reflector is of the type so often employed in the lighting of show windows and is arranged so as to direct the light upon the ceiling, and at the same time to be completely out of sight. Between the door and the front window there is a tall pedestal supporting a jardinière, the latter being decorated around the edges with artificial ferns. Concealed in this jardinière is a 40-watt tungsten lamp equipped with a reflector also arranged so as to direct the light upon the ceiling. On the top shelf of a row of hanging shelves in the opposite corner of the room there is another 40-watt tungsten lamp similarly installed, this lamp being concealed from view by means of a number of small ornaments. Still another lamp of the same kind as the two just mentioned is concealed behind a picture in the remaining corner of the room, and a steel reflector is used to direct its rays toward the ceiling. In addition to the above lamps there is a piano lamp for lighting the music.

The ceiling in this room is done in old ivory and the walls in salmon. The illumination is ample for all purposes and the effect certainly very pleasing.

The lights in question are controlled by means of two switches. One of these is a two-point electrolier switch, one point of which is used to throw on one of the lamps behind the piano and the other that behind the picture. The other switch controls the remaining lamps, the piano lamp being operated, of course, by means of a key socket. These switches provide very convenient control.

Dollar Wiring Kinks.

Every reader is invited to contribute to this column. It does not matter how few words are used to explain a "Dollar Wiring Kink," provided the idea is made clear; and if a diagram is necessary, a rough pencil drawing will serve. The idea itself must, of course, be new and bright. A dollar will be sent to the contributor upon publication.

A Handy Tool for Wiremen.

Take a 0.75-inch pipe cap and bore two holes in one side about one-eighth inch in diameter and one-quarter inch apart. Pass a piece of No. 12 wire through the holes and twist them up to form a handle. Cut the wires off at any desired length and put a wooden handle on the end as shown in the accompanying illustration. This little ladle is a very useful tool for holding melted solder in connection with fixture work. By its use one avoids spilling solder on the floor or blackening the ceiling by the use of a torch. The ladle can be hung on any torch that will hold a soldering iron.

Ladle for Solder.

D. O. Bassett.

A Novel Connector.

While doing some temporary work with No. 2 bare copper wire I found myself without means to connect two wires which were too short to twist together—even if twisting them together had been permissible, which it was not owing to the fact that these wires had to be continually opened in making certain tests. There being no standard connector available, I overcame the difficulty by the use of a half-inch union and two nipples of the proper length, borrowed from the steam fitter on the job, which, nipples were plugged at the union end and poured full of lead. While the lead was hot an end of the wire was inserted in each nipple. As soon as the lead had cooled we made the desired connection by simply screwing the union together with the fingers. Since the circuit had to be broken and closed again frequently, the job gave satisfactory service until a connector of the proper sort could be secured.

The permanent use of a fitting of this kind is not to be recommended, of course.

Charles Smeeth.

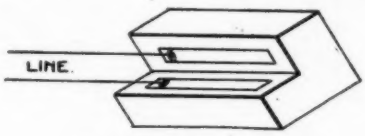
Running Wires in Furnace Shaft.

In running a pair of wires in a finished house, from second story to basement, advantage was taken of the large space unused in the vertical run of a furnace pipe to make a saving in the use of circular loom, some twenty-five feet in all. The two wires were fastened by porcelain knobs each to a separate 12-foot strip of furring that happened to be at hand. The furring strips with wire attached were then pushed down the opening made available by taking out the tin register-box, and were securely nailed to the floor timbers, top and bottom, giving rigid support to the wires and holding them well separated from each other and from the furnace pipe. The circuit was then extended in each direction from the ends of the furring strips.

C. F. A. Siedhof.

For Testing Incandescent Lamps.

In nearly every electrical contractor's office or shop it is necessary many times a day to test incandescent lamps for broken filaments and the like. We find terminals arranged as shown in the figure very convenient for this purpose. When it is desired to see whether a lamp will burn, the base is simply held to the two contacts on the block. Besides being a time saver, the device is such that there is little danger of the bare strips being short-circuited accidentally.



Lamp-Testing Block.

H. J. Bluhm.

A Novel Way of Pulling Wires Into Conduit.

In your issue two weeks ago I saw a contribution from E. F. Thomas describing his method of pulling wires past sharp bends in conduit. Some time ago I struck a concealed conduit job. About midway of the pipe there was a sharp bend or some other obstruction past which the steel tape would not go. We tried all means of fishing and were about to give it up as a bad job. Finally we hit upon the following plan.

We procured a compression hand pump—the kind the gas men use to blow out pipes—and also a pipe tee. We screwed this tee to the end of the conduit. To one opening in the tee we screwed our pump hose, leaving the other hole in the tee open. Next we cut a cork stopper to the shape of a ball, making it considerably smaller than the conduit. To this cork we tied a small but stout cotton string somewhat longer than the pipe. We fed this cork and string through the open end of the tee by degrees, one man holding the cord and the other the pump. After getting a certain amount of the cord in the pipe we would close the hole in the tee and turn on the air blast. In this way we simply blew that string through without any trouble. We tied a length of magnet wire to the end of the cord and the rest was easy. This same method can be used in wiring up fixtures in which there are many crooks and bends; that is, the string minus the cork and pump—using the workman as a blower.

Thomas E. Klinge.

Weighting the Steel Tape.

In wiring all houses, I have had splendid success in fishing wires under floors in the space between the laths and the bottom of the floor beams by using an ordinary fishing wire weighted at one end with a short piece of soft solder. The weight keeps the snake head down and prevents it from coiling up in the floor bays.

Weighted Fishing Tape.

Morris Morriarty.

Locating Short-Circuits in Lighting Fixtures.

I read with interest the wiring kink in which W. C. Lockwood explained his method of finding short-circuits in incandescent lamp fixtures, which appeared in your issue of February 10. In a job of this kind I usually proceed by placing the lamp in one of the fuse receptacles and then examining the various fixtures by inserting my finger in the lamp sockets, one after the other. If a shock is felt I know that the fixture under examination is in good condition and hence proceed to the next one. When I find a socket which does not seem to be alive I am sure that the trouble is in the part of the fixture or circuit supplying it with current; or, if no shock can be felt in any of the sockets on this fixture, it is evident that the short-circuit is in the stem of the fixture. I find this method exceedingly convenient because it does not necessitate the disconnecting of any fixture until the faulty one has been located.

It might be well to add, however, that on a 220-volt circuit it is sometimes possible to get a disagreeable shock in this way.

E. M. Seagrave.

Legal Notes

LIABILITY OF PUBLIC-SERVICE CORPORATION IN ERECTING POLES OR STRINGING WIRES IN A HIGHWAY.

By Maguire and Mooney.

The right of a public-utility company to erect poles and string wires on public highways varies in different states and is dependent upon the terms of the franchise. Where damage is done to abutting property by obstructing access, removing shade trees, etc., the company is liable.

One of the peculiar difficulties that arise is the extent of the privilege to string wires and place the equipment upon public streets and highways. The multiplication of poles and wires for the purpose of carrying electric current makes the question of the abutting owner's right to object to the use of the street in front of his property of much practical importance.

A company cannot, to be sure, erect its equipment upon another's land, without permission from him, or without payment for the damage done. But the question arises in cases where the company does not intend to use another's land, but is erecting its equipment at the curb of the street or at some other place in the highway.

The question arose in the well known case of Krueger vs. Wisconsin Telephone Company, 50 L. R. A., 298. In this case the company operated its system in the city of Neenah. The ordinance gave it the right to erect and maintain its system in the city. The company was authorized to use the rights of way through and upon the streets, sidewalks, alleys and public grounds for the use of the poles and necessary wires, provided they were set in such manner as not to interfere with public travel, and not to hinder the flow of water in the gutters. Under this ordinance the company constructed its system, but later an increase of business necessitated a reconstruction of the system. It was deemed desirable to change the location of some of the poles. Krueger owned a building on a prominent corner in the city. The windows in the ground floor of the building fronted on two streets, and were of the large plate-glass kind. In changing the location of some of the poles, the company, without the consent of Krueger, set a large pole at the street corner, a few feet from the corner of the building, and immediately in front of the show windows. Krueger claimed that this materially damaged the property by obstructing the view from the store, and that the maintenance of the pole at that place constituted a nuisance and greatly interfered with the proper use and enjoyment of the property. The company contended that the location of the pole at this point was absolutely necessary for the proper management of its exchange, and denied that the pole interfered with the use of the premises or obstructed or hindered the use of them. But the court decided that Krueger was entitled to be paid for the damage done to his property in placing the pole in front of his store.

And in the case of Donovan vs. Allert, 58 L. R. A., 775, one of the poles was placed directly in front of a walk leading from the sidewalk to the dwelling house. The company did not obtain the consent of the lot owners and consequently the court held it must make compensation.

Another case arose where Ann Burrall asked for an injunction to restrain the American Telephone & Telegraph Company from committing trespasses upon a public highway. It seems from this case that in October, 1896, the company entered upon the highway and erected telephone poles, including crossarms and insulators, and upon those poles strung its wires, and thereafter, from time to time, kept adding wires and making repairs. In 1906, Mrs. Burrall became alarmed that some new additions were to be made to the equipment, and sought to restrain the company from further injuring her property. The company proceeded on the theory that its poles and wires at this point were part of its long-distance system; that the business transacted over these wires each day amounted to about 200 messages; and that if the poles and wires should be removed, or the use of them restricted, it would be compelled to make a detour and would be put to considerable expense. The court held that it was unlawfully using the highway and accordingly ordered that the poles and wires be removed.—3 L. R. A. (N. S.), 324.

There are many reasons why the courts have followed the foregoing rule. When the streets and highways were dedicated for public use the intention of the dedication was that they should be used for ordinary travel, that is, such as is ordinarily seen thereon. Streets are primarily for travel and transportation, and while they were also intended for the transmission of intelligence, yet the modern use is so different from the other and requires such a permanent occupation of the soil, that it cannot be supposed that the landowner ever contemplated such occupation. Motion is the primary idea of the use of the streets. Nothing was intended that would remain as an obstruction. The companies contended that the very use of telephone wires lessened travel by persons on the streets, and there is much in the contention that electric light or power wires also lessen travel by persons on the streets, but most of the states have held that even though the electric light or power wires facilitated business or lessened travel, nevertheless they were an obstruction of light and air and deprived the landowner of free access to his house.

Ordinarily in the dedication of streets the owner still retains a certain interest to the middle of the street, and accordingly the erection of poles and the stringing of wires is in effect upon the abutting owner's property.

One court expressed itself that "when we recall the forest of poles, with their clumsy appurtenances, and the network of wires, and even cables, with which some of our city streets are encumbered, it seems hard to say that an owner, whose light is cut off, who has the safety of his buildings and the occupants endangered, and access to his property impeded, is not entitled to compensation for the damage." And if one company has a right to erect poles and wires other companies have the same right and there would be no limitation practically to what would be done. So if the landowner cannot complain of a series of poles in front of his property then he cannot prevent poles being put so as to form a barrier between his land and the street, and

cannot prevent the stringing of such a number of wires as to render the vicinity dangerous.

There is another rule, upheld by the States of Indiana, Louisiana, Massachusetts, Michigan, Minnesota, Missouri, Tennessee, Kansas, Montana, Vermont, Pennsylvania, Connecticut and the District of Columbia, that is to the effect that the erection of poles and wires in the highway do not constitute such a burden that the abutting owner must be compensated, even under the theory that the abutting owner owns to the middle of the highway. But even under this rule the company must have been duly franchised or licensed to use or occupy the streets and highways.—Wyant vs. Central Telephone Company, 123 Mich., 51.

The theory of this rule is that when the streets were dedicated for use nothing was known of the electrical inventions for lighting, telephony and power and that though the streets could not have been intended for those purposes at that time, a reasonable construction would permit poles to be erected and wires to be strung thereon. The fact that poles and wires are necessary to light the streets and make them safer for travel at night is another reason why they should be authorized. Some courts, in following out this rule, stated that gas pipes and sewer pipes, though perhaps not exactly within the intendment for which the street was opened, are a convenience and a comfort to the public and they have been held properly placed in the streets. But this is different from electric light poles. Pipes, under the surface of the street, are not exposed and the abutting property is not injured by their presence. And another strong argument has been that when the streets were opened for use automobiles may not have been known but the fact that they have been permitted on the streets constituted the adoption of improved modes of conveyance, and accordingly electric light poles should be permitted.

Whether the company has a right to occupy the street or not, other questions arise that sometimes put a different phase on the question. A company may have a perfect right to erect its poles on the highway but in order to erect its poles and string its wires in a proper manner obstructions must be removed, and trees trimmed.

This question arose in the well known case of Board of Trade Telegraph Company vs. Barnett, 107 Ill., 507. In this case the company dug holes and erected poles preparatory to stringing wires, under authority given them by the proper public officials. Barnett objected to this, claiming they were digging on his property, but the company, exhibiting its authority from the public officials, went ahead and proceeded to erect 26 poles along Barnett's hedge. These poles were erected outside of the hedge but so close to it that two hedge trees, intended as gate posts, had to be cut down and a great deal of trimming was done. Barnett declared he was damaged by the cutting of the hedge and he was damaged by the fact that he could not trim the hedge with the machine constructed for that purpose.

The court, in deciding the case, held that the authority given the company to construct its system on the public highways was subject to the constitutional inhibition that private property must not be taken or damaged for public use without just compensation. Barnett was awarded $78 for his damage.

In Gorham vs. Eastchester Electric Company, 30 N. Y. Sup., 125, the owner, Gorham, objected to the company cutting the limbs off trees that were standing in the highway in front of his premises. The company intended to string wires and claimed that the limbs had to be cut to enable it to put its wires up properly. The court held that as the title of the owner of the premises extended to the middle of the street the cutting of the trees was improper and Gorham was entitled to compensation.

In the case of Brown vs. Asheville Electric Company, 138 N. C., 534, the company cut down a large shade tree. The tree stood upon the sidewalk at the outer edge. Brown complained and at the trial the jury awarded him $499, and the court sustained this.

The reasons for these rules are based upon the theory of compensation for that which the owner is deprived of. Shade and ornamental trees are considered very desirable in front of residence property. They contribute to the comfort and enjoyment of the home. Not only that, but shade trees are conducive to the public health, comfort, enjoyment and well being of the residents. Accordingly, most of the cities of the country encourage the property owners to plant and grow such trees in front of their property, and laws protecting the trees from injury and prescribing penalties for those who injure them are enacted. The municipality itself is the only one that may authorize the destruction or removal, and the municipality must exercise that right only with prudence and with reason. The public-utility company cannot, unless express authority has been obtained, remove, or trim trees upon the highway. But even, if the company obtains from the owner a license or a permission to trim the trees which come in contact with the wires it does not permit unnecessary trimming.

But there is a different rule, upheld by the courts, that holds that a company may erect its lines in the highway without compensating the abutting owner. They reason that anyone placing trees in a highway places them there with the understanding that they can remain there as long as the space occupied by them is not required for public use, and a company may remove or trim the trees. Of course, the removal or destruction of trees should be done only when necessary, because even under this rule the company would be liable if it did anything unnecessary to accomplish its purpose.

Interesting Cases.

BEST APPLIANCES KNOWN TO SCIENCE REQUIRED.—The Supreme Court of Oklahoma holds that, while not an insurer against unforeseen and unavoidable accidents, an electric light company, using the public streets of a municipality for its poles, wires, and appliances, in conducting its business is required to exercise the highest degree of care, and to maintain in the best possible condition the best appliances known to the science to render its business safe, and to use a degree of care, caution and circumspection in keeping with the dangerous character of its business. Absence of insulation on an electric wire, in violation of an ordinance, is prima facie evidence of negligence.—Ladow vs. Oklahoma Gas & Electric Company, 119 Pac. R., 250.

MECHANIC'S LIEN FOR ELECTRICAL SUPPLIES.—A supply company furnished to a light and power company for its light and power plant material consisting of insulators, crossarms, transformers, locust pins, oak brackets and other electrical supplies. The wires, furnished were attached to the dynamo, but were blown down, disconnected, and rolled up. The referee found as a fact that the transformers and a wire were strung on the electric light poles, and that the oak brackets, locust pins, cross-arms, and other items were not shown to have become any part of the building. It was denied that the materials were such as entitled the supply company to obtain a lien under the North Carolina statute because the materials sold were not put in the plant of the light and power company, so as to lose their identity, but were articles which did not become a part of the building or realty, and hence were not "materials furnished," in contemplation of the statute, and the Supreme Court of North Carolina concurs in that conclusion.—Fulp & Linville vs. Kernersville Light & Power Company, 72 S. E. R., 869.

Public Service Commissions

WISCONSIN.

At the joint request of the Waupaca Light & Railway Company and the City of Waupaca, the Commission has acted as arbitrator on certain questions relating to street lighting in the city of Waupaca. The chief questions in controversy were whether the 6.6-ampere inclosed alternating-current arc lamp was a fair substitute for the 9.6-ampere open direct-current arc lamp under a contract which called for a lamp of 2,000 nominal candle power and if the substitution was not fair, what damage has been sustained by the city and what adjustment of differences would be equitable to both parties. About two years ago the city of Waupaca refused to pay the bills for street lighting on the grounds that the inclosed alternating arc lamps, which had been substituted for the open direct-current arcs in 1904, were not equivalent to the latter under the terms of the contract. About two years ago, the company increased the current in the arc circuit from 6.6 amperes to 7 amperes, where it has subsequently remained. To determine what differences there were in the service rendered by the two types of lamps, the engineers of the Commission carried on an extensive series of tests, most of which were photometric, on lamps operating under actual service conditions. A group of cities was selected where the 6.6-ampere alternating arc lamp, for example, was giving good satisfaction and tests were made upon the wattage, steadiness of arc, light distribution, etc. The same series of tests were repeated in other cities for the 7 and the 7.5-ampere alternating arc and the 9.6-ampere direct-current arc. General comparisons of illumination from photometric tests taken in a vertical plane at varying distances from the light source, are given in the table.

INTENSITY OF ILLUMINATION.

Ratio of	Distance in feet 50	100	150	200	250	Average
6.6 alternating to 9.6 direct	41.8	54.0	54.3	63.1	60.3	54.7
7.0 alternating to 9.6 direct	40.4	55.2	57.5	68.4	75.8	59.5
7.5 alternating to 9.6 direct	55.3	62.2	70.1	80.4	84.5	70.5
6.6 alternating to 7.5 alternating	75.7	86.5	77.6	78.3	71.5	77.9
7.0 alternating to 7.5 alternating	73.2	88.7	82.2	85.2	90.0	83.9

While these values may represent a comparison as to intrinsic brilliancy they are not sufficient in themselves, in the Commission's opinion, to determine fairly the relative merits of the various lamps. The results of the investigations showed that the inclosed alternating-current arc lamp possessed certain desirable qualities, more or less intangible in nature, to a much greater degree than did the open arc. As far as intensity of illumination alone is concerned, the engineers concluded that the 6.6-ampere and the 7-ampere inclosed alternating-current arcs were inferior to the 9.6-ampere direct-current open arcs by 18 to 20 per cent and 10 per cent respectively.

An investigation into the cost of service showed that the street lighting department, when using the open arcs, was earning practically nothing above depreciation, and that the substitution of the cheaper lamp had not materially increased the net earnings. In this connection it was pointed out that the salaries of the general officers, constituting about 18.5 per cent of the operating expenses, was entirely too high.

The Commission held in conclusion that the 7-ampere alternating arc was not the equivalent of the 9.6-ampere direct-current arc from the standpoint of intrinsic brilliancy but that this deficiency was practically counterbalanced by a superiority in other respects. The difference, if any, was too small to be measured by any monetary standard.

MARYLAND.

The Washington, Spa Spring & Gretta Railway Company, which operates an electric railway between 15th and H Streets, N. E., Washington, and Bladensburg in Prince George's County, Md., is planning to equip its line with the new Edison storage-battery cars. This will be the first electric line in the state to be operated on the Edison storage-battery system. It is expected that the line of the company will be extended to Berwyn, six miles away, in about 60 days. A petition to the Public Service Commission asks for authority to issue $50,000 of bonds with which to pay for the new equipment. It proposes to buy four cars from the Federal Storage Battery Company, of New Jersey, at $9,000 each. The bonds proposed to be issued will be sold at 85 and with each $1,000 bond will be issued $1,000 of the common stock as a bonus.

NEW YORK.

In a communication addressed by Theodore P. Shonts, president of the Interborough Rapid Transit Company, to the Public Service Commission, a definite subway offer is made to the city officials. As a whole the plan submitted is a modification of the original offer only with reference to the more unimportant details. There are twenty-five modifications made, but none of these affects the fundamentals of the plan.

As officially filed the latest offer calls for the construction of a four-borough subway and elevated system to cost $112,000,000; of this total $56,000,000, or one-half, is to be contributed by the city, the balance to be expended by the Interborough Company. In addition to this the Interborough will expend an additional sum of $21,000,000 for equipment. The same basis for a preferential payment of 8.76 per cent on the proposed investment of $77,000,000, and also on the $48,000,000 representing the valuation of the existing subway system is included in the present plan. It is further provided that a similar percentage shall be allowed to the city on its money in the form of interest and sinking fund. After these deductions the Interborough Company will share equally on all profits. The new subway leases are to run for a period of forty-nine years and the present subway lease is to be leveled for the same period. The earnings of all the Interborough subways and elevated lines are to be pooled. From these earnings will be deducted first the operating expenses, including the cost of depreciation, renewals, obsolescent taxes, insurance and rent upon the existing subway lines to the city until the system is completed.

The report, made public at the office of the Public Service Commission, showed that during the month of January, 1912, the various transportation companies, under the jurisdiction of the Commission, reported 5,448 accidents resulting in injuries to 3,348 persons. This is an increase over the same month last year.

The number of persons killed during this month, namely, 15, is the lowest for one month reported to the Commission since the Commission was organized on July 1, 1907.

Questions and Answers.

All readers of the Electrical Review and Western Electician are invited to submit questions and answers to this department. Full names will not be printed except where the writer indicates his willingness therefor. Anonymous communications will not be considered. Questions relating to electrical matters of any kind will be inserted. Answers from our readers should be received in this office preferably within nine days of the date of publication of the question, and will be published in a subsequent issue. Payment will be made for all answers published.

Questions.

No. 52.—Electric Level Indicator for Tanks.—Is there an electrical device for indicating at a remote point the varying height of water in a ten-foot tank?—J. A. S., Montreal, Canada.

No. 53.—Connection of Automatic Telephones.—We wish to connect a number of automatic telephones (they are of the three-wire, common-battery type) to a line running to a central location equipped with a common-battery transmitter. This system should be so arranged that any one subscriber can call a certain number and be connected to this line and also be able to hang up his receiver and disconnect without interfering with any other parties that may be on the line. Can this be done? If so, how?—R. B., Holland, Mich.

No. 54.—Resistances for Shunt-Motor Starters.—How are the resistances for a direct-current shunt-motor starting box calculated? How many contact points should there be? I have in mind building a starter for a five-horsepower, 115-volt motor that runs at 1,200 revolutions per minute.—S. N. T., Kansas City, Mo.

No. 55.—Connection of Circuit-Breaker Trip Coils.—On a 2,300-volt switchboard, is it good practice to use oil switches having their automatic trip coils connected directly in series with the high-voltage conductors, or must these coils always be operated by means of series transformers?—J. E. L. Herrington, Kans.

Answers.

No. 38.—Wound Rotor for Induction Motor.—How is the rotor of a three-phase induction motor wound so as to have only two slip rings? I recently saw one whose speed can be regulated by changing grid resistances in series with the rotor, but it had only two slip rings, whereas I think it should require three.—D. T., Highland Park, Ill.

One of the terminals of the rotor is grounded to the shaft so that it takes the place of one of the slip rings. This is the case if the machine is made by the General Electric Company. This method saves some wiring and one set of brushes as the bearing takes their place. It also reduces the care required to keep the machine in service.—F. D. K., Schenectady, N. Y.

A three-phase rotor can be equipped with only two slip rings if one of the phases is permanently connected to the frame. This is not good practice owing to the resistance of the oil film in the bearings. A single one of the phases, or the rotor wound with only a single-phase winding, will give fair results but with poorer economy. This gives only two rings.—W. M. P., Seattle, Wash. [Similar answer from C. T. P., San Francisco, Cal.]

No. 47.—Effect of Lubricating Oil on Generator Windings.—In a central station of which I am in charge, I find it difficult to keep the engineers from flooding a portion of the windings of the dynamos with oil while filling the bearings of the machines. In the case of 2,300-volt alternators, is there danger of such lubricating oil as is commonly used spoiling the insulation of the armature windings?—W. I. L., Chapel Hill, N. C.

Clean and dry oil is a non-conductor of electricity even at the higher voltages, but it is a solvent of many of the cheap grades of varnishes and even of some of the better grades. It appears from this that the oil would do no harm, but it usually carries with it some dirt, grit, and moisture which in time might cause the machine to break down. I would take no chances of letting any more of this oil get into the windings that I could help; besides, I don't believe it is good practice to waste oil needlessly nor to let it slop around.—E. M. R., Saginaw, Mich.

A new machine of any reliable manufacture has the windings treated with varnishes and compounds that will withstand action of oil, but when a machine has been in service for some time, the heat and cold and vibration develops minute and almost unobservable fissures in this protection into which oil is very readily drawn by capillary attraction. Some oil is a good insulator, but ordinary lubricating oil from generator bearings, besides probably containing a little moisture, has in suspension the very small particles of metal worn from the bearings, and after leaving the bearings absorbs the carbon and copper dust caused by the wear of the brushes and commutator or collector. When this mixture has been soaked into the windings for some time and has caused the insulation to rot the resistance of the insulation is decreased to such an extent that a ground or a short-circuit is the usual result. Engineers and oilers around a plant should be impressed with the fact that this damage is liable to result from letting oil run out the bearings. For generator and motor bearings one part of oil to ten parts of ordinary attention is a very good proportion.—R. W. E., Chillicothe, O.

No. 48.—Opening of Circuit-Breakers During Thunder Storms.—In our plant we were troubled greatly during thunder storms by switchboard circuit-breakers opening. Was this caused by the line wires swinging together and thus causing a short-circuit or was it an effect due to lightning?—G. K., Tulsa, Okla.

I can say that, having had occasion to work in Tulsa during violent electrical storms, I noticed that the circuit-breakers in every instance were thrown at exactly the same time as the discharge of lightning took place and not between flashes. This would indicate that the trouble was from lightning and not caused by short-circuits. The spacing between wires should not permit of their swinging together.—J. J. C., Topeka, Kans. [Similar answer from J. T. W., Lake Crystal, Minn.]

No. 49.—Compound Exciters.—Does a compound-wound exciter give better regulation for a three-phase alternator than a shunt-wound exciter? If not, what are the reasons for its use?—L. A. C., Lansing, Mich.

As the exciter is used to furnish power to a circuit that does not change its resistance except through the agency of a manually controlled device there is no reason for the use of a compound-wound exciter, the generator regulation depending on other factors. A compound-wound machine is often used owing to its being a standard stock form.—W. M. P., Seattle, Wash.

No, it does not give better regulation ordinarily; it may even be slightly worse, if the engine speed is not steady. However, if automatic voltage regulators are used, it is found that these respond better with compound exciters.—W. F. B., Lansing, Mich.

No. 50.—Rewiring Fan Motor.—I have some 108-volt, 120-cycle, alternating-current fan motors. How can I change their wiring to make them suitable for 60-cycle current?—R. G., Sault Ste. Marie, Ont.

There may be motors that can be rewound for higher or lower frequencies, but it would require such a complete change in the wiring that the cheapest way out of such a difficulty would undoubtedly be to sell the 120-cycle motors for what can be gotten for them and buy new 60-cycle motors. Fan motors can now be purchased at a very moderate cost.—W. J. W., High Falls, Wis.

If the fans for 108-volt, 120-cycle currents are eight pole, fair results can be obtained if new coils are wound so that the coils will span two poles instead of one. They should have ten per cent more turns. The shading coils should be removed from the pole that would otherwise have the coil in the center of the main coil. If the fans are provided with ten poles the only thing to do is to scrap them. The eight-pole fan will run hot even with the new arrangement.—W. M. P., Seattle, Wash.

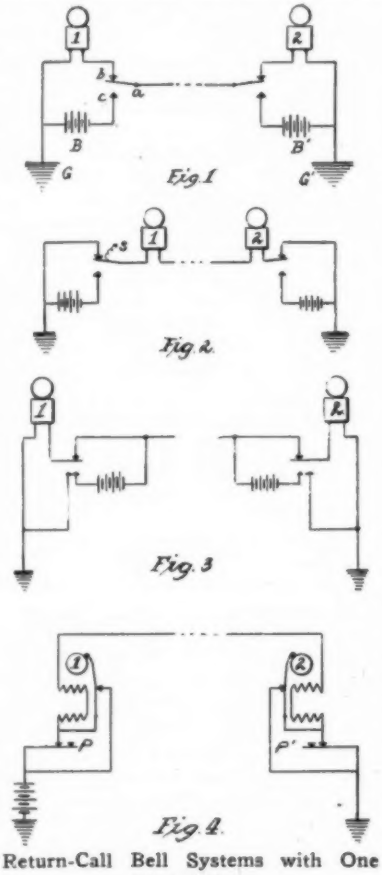
No. 51.—RETURN-CALL BELL SYSTEM WITH ONE WIRE.—There is one wire running between two buildings about half a mile part. Is it possible to connect up a return-call bell system on this one wire, and, if so, how may it be done?—W. V. S., Jersey City, N. J.

Solution 1.—This can be done by using a local battery and return-call push-button at each end of the line and using the ground for return. As shown in Fig. 1, connect one end of the line to the center point *a* of the special push-button. The upper contact *b*, which is normally closed, should be connected to one side of the bell. To the lower point *c* connect one side of the battery. The other side of the bell and battery are connected together and to a good ground *G*. Both stations are wired in the same way. Pressing down on either button rings the bell at the other end of the line.—H. M. P., Milford, Ill.—[Similar answers from I. H. M., Des Moines, Ia.; J. F. D., Pocomoke City, Md.; F. A. O., Tyrone, Pa.; G. E. A., Chicago; R. B., Holland, Mich.; W. M. P., Seattle, Wash.; A. W. P., St. Albans, Vt.; J. A. R., Jersey City, N. J.; C. J. S., St. Louis, Mo.; J. H., Cold Springs, N. Y.; R. W. E., Chillicothe, Ohio; J. J. C., Topeka, Kans.; L. H. D., Pittsfield, Mass.; W. C. L., Chicago; W. A. E., North Milwaukee, Wis.; W. H., Chicago; F. D. K., Schenectady, N. Y.]

Solution 2.—Fig. 2 shows how this can be easily done. A double-contact push-button is used; the spring *s* holds the button on the upper contact except when it is pushed down. When either button is pushed both bells will ring in series. In this case one bell should be a vibrating bell and the other a single-stroke bell to give the best results. Good ground connection should be made, preferably to a water pipe, if possible.—W. C. L., Chicago, Ill. [Similar answer from W. J. W., High Falls, Wis.]

Solution 3.—Two ordinary bells can be used and connected as in Fig. 3. Special push-buttons are needed; these can be of the return-call pattern with an additional contact below. Ground connection must be made to a ground plate or to water pipes. If the wire that short-circuits the local bell is left out, a regular return-call push can be used without alteration; this method would put the two bells in series, however, in which case they would have to be of the same resistance and tuned to work together.—W. H. B., Norwood, Man., Canada.

Solution 4.—If a closed-circuit battery is used, such as gravity cells, only one battery is needed. The circuit is normally closed through interrupted relays with bell attachment, as shown in Fig. 4. Current flowing through the coils holds the armatures down and the clappers against the bells. Pressing down button *P* momentarily breaks the relay circuit, allows the armature to fly back and strike against its contact and thus makes an ordinary bell of the arrangement; the making and breaking of the circuit also rings bell 2, even though its button remains closed. On releasing button *P* at bell 1 again the circuit through the coils is once more permanently closed.—R. B., Holland, Mich.



Return-Call Bell Systems with One Line Wire.

Service Pensions in Baltimore.

Twenty-six of the employees of the Consolidated Gas, Electric Light & Power Company were last week awarded service certificates in recognition of their faithful and efficient service to the company. This marks the putting in force of the pension system of the company, adopted some months ago, and those who received the certificates are the first to be put on the honor rolls of the company. They retire from the company's service and will be free to obtain other employment if they so desire, but they will receive for the remainder of their lives an annual sum determined by the length of their service and the average of their salaries for the last ten years.

There are three classes of men eligible for retirement under this provision: (1) those who have reached the age of 65 and who have been in the company's employ for 15 years; (2) any person who has been continuously employed by the company for 20 years and who may have been disabled; (3) any person who may have been injured while in the service of the company and who shall have served with the company for ten years. The retirement fund is provided entirely by the company and no contributions to it on the part of employees are required or permitted. The lengths of service of the first 26 men on the retirement list have ranged from 56 years down to 15, the average being about 36 years. The oldest employee in point of service was William Henry Boesche, who for 56 years worked continuously at the company's plants. The majority of the men retired began work with the Gas Light Company of Baltimore, the first gas company in America.

Hydroelectric Power in New York.

The undeveloped water powers of the State of New York are estimated by the Conservation Commission to be upward of 1,500,000 horsepower. In presenting to the Legislature a measure to utilize this undeveloped resource, the Commission contemplates the construction of high-tension transmission lines from the point of development, across the State, east, west, north, and south.

It is estimated that high-tension transmission lines can be constructed for about $5,000 per mile, exclusive of right of way. New York now has canal lands covering a considerable part of the distance that may be utilized for this purpose. It is estimated that electricity could be placed upon these transmission lines at approximately $10 per horsepower. To this must be added the cost of transmission to the various municipalities.

The Hydro-Electric Commission of Ontario charges $18.50 per horsepower delivered at Toronto, a distance of about seventy-five miles. In the western section of the State the cities of Niagara Falls, Buffalo, Lockport, Tonawanda, Fredonia, Dunkirk, Jamestown, Salamanca, Olean, Westfield, Batavia, Rochester, and other communities will be served at very reasonable prices. The urban population of this section is about 800,000 people.

The distribution for lighting public streets and buildings, domestic and commercial lighting, and for power purposes is to be done by the several municipalities.

Large Electric Smelter.

A 12,000-horsepower electric smelting plant for pig iron is nearing completion at Domnarfvet, in northern Sweden. Single-phase, air-cooled transformers with regulating apparatus are being installed to deliver current to the electric blast furnace. This plant is the outcome of the successful experiments at Trollhättan.

Northwestern Electrical Show.

From all indications the 1912 Northwestern Electrical Exposition to be held in the big Minneapolis Armory, March 16-23, will go down in history as one of the great electrical achievements of the country. Nearly one hundred exhibitors coming from about 50 different cities and 23 states will take part. Unusual electrical and decorative features have been planned, and so thoroughly have details been laid out that construction is expected to be complete 24 hours before opening.

The Exposition will open in a blaze of electrical glory and industrial animation at 2 p. m. Saturday, March 16, in connection with which impressive ceremonies have been planned. The doors will be closed Sunday, March 17, opening again at 10 a. m. Monday, and every day thereafter, closing finally at 10:30 p. m. March 23.

Four important electrical meetings take place at the Armory during the period of the exhibition. The official program of the Minnesota Section of the American Institute of Electrical Engineers is now available. Monday, March 18, is "Illumination Day," and starts in with an afternoon session. The first paper will be delivered by W. D'A. Ryan, Schenectady, N. Y., on "Lighting From Early Ages to the Present Time," and will be accompanied by lantern slides. Arthur L. Abbott, of St. Paul, will present the second paper, entitled "Demonstration of Illumination Problems."

Tuesday, March 19, will be designated "Central-Station Day." The first paper, "Central-Station Distribution," will be presented by H. B. Gear, Chicago, Ill. The second paper will be read by E. H. Schofield, Twin City Rapid Transit Company, and will be entitled "Power-Station Economies."

An elaborate Institute banquet will be given in the grand ball room of the Hotel Radisson on Tuesday night, at which Chairman C. L. Pillsbury will be toastmaster. A speaker at the banquet will be Ralph W. Pope, secretary emeritus of the Institute.

At 10 a. m. Wednesday, March 20, the fifth annual convention of the Minnesota Electrical Association opens in the Armory assembly room. The convention covers three days, the revised program being as follows:

On the first day, E. Jackson, St. Paul, will read a paper on "Oil and Other Internal-Combustion Engines." R. E. Brown, Mankato, will then present a paper on "Increasing Revenue in Small Towns."

On March 21, a paper will be presented by Norman Macbeth, Bloomfield, N. J., on "Competitive Illuminants." C. G. Edwards, Albert Lea, Minn., will follow with a paper on "Accounting."

On Friday, March 22, there will be morning and afternoon sessions, with a paper by William Coals, Warren, O., on "Mazda vs. Gas, Gasoline and Arc Street Lighting." There will be one on "Electric Vehicles," by S. H. Conkey, of the Minneapolis General Electric Company. The afternoon session will close the convention with election of officers and arrangements for committees to take care of work during the following twelve months.

A special committee of Twin City central-station men and electrical jobbers is in charge of the entertainment features for the conventions, and have arranged a special sightseeing trip for Thursday afternoon, March 21. This will include a visit by electric vehicles to the three new stations of the Minneapolis General Electric Company, erected since the great fire of January, 1911. In the evening a banquet will be given in the beautiful Empire Room of the Hotel Radisson. The banquet will terminate by 8 p. m., so as to allow as many as possible to return to the Exposition Building in time to take part in the big Northwestern Rejuvenation of the Sons of Jove, who are planning to initiate at least 100 candidates.

Electric Week will be rounded out with the annual convention of the Minnesota Electrical Contractors' Association, convening on two of the Exposition days with an interesting program.

A feature of the show will be the formal opening by Thomas A. Edison, who, by pressing a button in his laboratory in Orange, N. J., at 2 p. m. central time, will start the wheels of the industrial exhibit.

Each day of the exhibition will be designated in honor of one of the great inventors identified with the electrical industry. Each one of these men upon the designated day will send a telegraphic message to the people of the Twin Cities and the Northwest expressing his views on the progress of the electrical art to date, a prophecy for the future, etc. The first message will be sent by Thomas A. Edison on Saturday afternoon, March 16. The other men who will be honored in this way and who will also send messages are Charles F. Brush, Alexander Graham Bell, George Westinghouse, Nikola Tesla, Elihu Thomson and Charles P. Steinmetz. The message from Mr. Edison will be received by the Governor of Minnesota, A. O. Eberhart. Upon the other days of the show messages will likewise be received by men prominent in the community, such as President George E. Vincent, of the University of Minnesota; James C. Haynes, Mayor of Minneapolis; Herbert P. Keller, Mayor of St. Paul; Archbishop John Ireland; Edmund G. Pennington, president of the Minneapolis, St. Paul & Sault Ste. Marie Railroad. The messages will be received on the main floor of the exposition in a working telegraph exhibit.

The decorative and lighting features for the exposition have been worked out by a firm of prominent architects in conjunction with Manager R. W. Clark, who has been devoting great energy to the preparations for the show.

The exhibit space has already been largely taken up and the following is an advance list of the exhibitors:

Alden Company, W. A., American Ironing Machine Company, American Multigraph Sales Company, American Steel & Wire Company, Anderson Electric Car Company, Baker Ice Machine Company, Baker Motor Vehicle Company, Batcheller, H. H., Berger Manufacturing Company, Bradstreet Company, John S., Burroughs Adding Machine Company, Century Electric Company, Columbia Phonograph Company, General, Columbus Buggy Company, Crane Company, Thomas A. Edison, Incorporated, Edison Storage Battery Company, Electrical Engineering Company, Electric Machinery Company, Electric Renovator Company, Electric Storage Battery Company, Fairbanks, Morse & Company, Farnham Printing & Stationery Company, Fawkes Auto Company, Federal Sign System (Electric), Felt & Tarrant Manufacturing Company, Flanders Electric Vehicle Company, Flour City Ornamental Iron Works, French & Company, William A., Fries-Patterson Company, General Electric Company, Hackney Ventilating Company, Hartig Electric Company, W. O., Haskins Glass Company, Heywood Manufacturing Company, Hollis Electric Company, Hughes & Dalley, Hughes Electric Heating Company, Hupp Corporation, Hurley Manufacturing Company, Ilg Electric Ventilating Company, Judd Laundry Machine Company, Keller Manufacturing Company, Kemp Bros. Auto Company, Kenneth Smith Company, Kenyon Searchlight Company, Kinetic Engineering Company, Laird, R. M., McCray Refrigerator Company, Manhattan Electric Supply Company, Mattschke, W. B., Minneapolis Electric Motor Company, Minneapolis Gas Fixture Company, Minneapolis General Electric Company, Minneapolis Washing Machine Company, Minerallac Company, Murphy Auto Company F. E., Myrlite Company of America, The, Northwestern Electric Equipment Company, Northwestern Fire Protection and Supply Company, Northwestern Fuel Company, Northwestern Telephone Exchange Company, Ohio Electric Car Company, Ornes, Esswein Company, Pierson-Wilcox Electric Company, Pyrene Company, Simplex Electric Heating Company, Studebaker Company, Valentine-Clark Company, The, Wagner Electric & Manufacturing Company, Waverley Company, Western Electric Company, Western Union Telegraph Company, Westinghouse Electric & Manufacturing Company, Zimmer Electric Renovator Company.

Chattanooga to Hold Exposition.

An electrical exposition will be held in Chattanooga, Tenn., this year, if plans of a company with $100,000 capital, now being formed in Chattanooga, materialize. In the near future an aggregate of 300,000 horsepower in electric current will be introduced to Chattanooga from three hydroelectric stations which are now in course of construction. These stations are located respectively at Parkersville, Tenn.; Hale's Bar, Tenn., and Tallulah Falls, Ga. Chattanooga will then be the second city of the United States in point of electric power and a notable exposition is to be held.

Government Wireless Station at San Antonio.

A new wireless station has recently been completed at Fort Sam Houston, San Antonio, Tex., established by the United States Signal Corps under the direction of General James Allen, intended to be used for providing wireless communication for military purposes in that region.

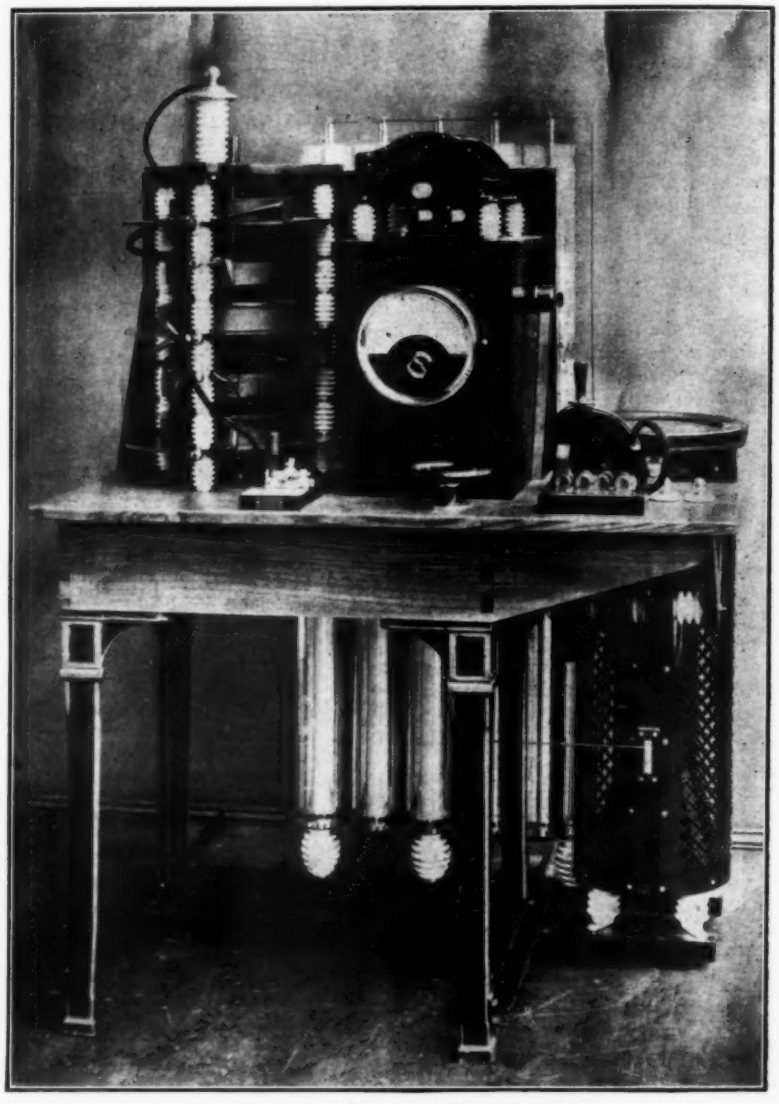
This new station equipment comprises the latest type of Telefunken wireless telegraph apparatus. The generator is installed in a two-story brick structure especially constructed for this purpose, and has a capacity of 10 kilowatts. The station is established in the northeastern portion of the Fort Sam Houston reservation, and the construction of a building in accordance with Signal Corps plans was begun several months ago. The building provides on the lower floor an operating room and power room, and on the upper floor quarters for the necessary operators.

The equipment is connected to a T-antenna, the horizontal portion of which is sustained between two 200-foot steel towers about 350 feet apart and provided with a suitable counterpoise.

One of the 200-Foot Towers.

The power equipment consists of one single-phase, 220-volt, 20-horsepower, Wagner motor, equipped with an automatic starting apparatus, controlled from the operating room belt-connected to a 10-kilowatt, 220-volt, 500-cycle generator furnishing the power for the wireless equipment. Provision is also made in the power room for the erection at a later date of an auxiliary gas engine if conditions should ever indicate the necessity for this equipment. At present the power for the driving moter is obtained from commercial sources, which are believed to be reliable, and the gasoline engine has, therefore, been omitted at this time.

The operators' equipment provides the usual facilities for the distant control of the driving motor, and the control of the voltage of the high-frequency generator in addition to the usual wireless equipment, comprising the latest features of Telefunken wireless equipment such as the quenched-spark gap and means for efficient sending, sharp tuning, and good receiving. In addition an auxiliary receiving set is provided.



Operating Set in the San Antonio Station.

The two 200-foot towers, weigh approximately 60,000 pounds each, and were erected by the Alamo Iron Works, San Antonio, Tex. The towers are riveted and provided with insulating bases to meet wireless requirements.

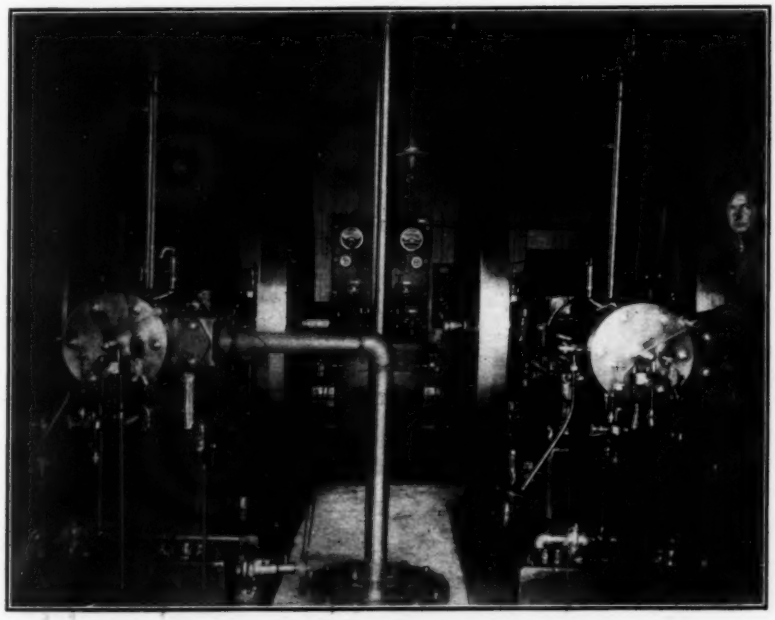
The T-antenna consists of a horizontal portion 300 feet long with the vertical wires junctioning at the center and leading directly down to the station, which is located midway between the towers. Both the horizontal and vertical section of the antenna consists of seven wires each of seven strands of No. 14 phosphor-bronze.

The counterpoise consists of two harps beneath the antenna and diverging from the station, each harp consisting of eight No. 10 copper-clad wires suspended approximately 17 feet above the ground. The opposite coun-

terpoise wires of each harp are joined at the station so that each wire is approximately 400 feet long.

This set is designed for transmission at three wave-lengths, namely, 600, 1,000 and 1,500 meters. The equipment is so tuned and arranged that it can be set for either of the above wave-lengths with little trouble and sharp and efficient tuning quickly obtained.

The station has only recently been put into operation, and, though it may be considered as comparatively untried, it has communicated with Fort Leavenworth, 600 miles away, and satisfactory communication has been established with points on the Mexican border and ships in the Gulf of Mexico. It is believed that it will be possible to establish satisfactory communication with points at least 600 miles over land, and that much greater distances can be obtained on the sea.



Engine Room in the San Antonio Station.

The mobile troops of the United States Army are provided with portable wireless stations of varying sizes which are used in field service. A two-kilowatt wagon set is used by the troops at the more permanent camps and locations, and a 120-watt pack set, transported on mules and with a range of approximately 25 miles, is provided for use with field artillery, cavalry and the more mobile troops.

Employers' Liability Act.

R. J. Falonie, an attorney of Chicago, delivered a very interesting address on this subject at the meeting of the Electric Club of Chicago on February 29. On May 1, 1912, such a law will go into effect in the State of Illinois and the speaker compared the salient points of this law with similar laws enacted in foreign countries. Corporations doing business in the state will, under the Illinois law, be invited to place themselves under its jurisdiction. Failure to do this will take from such corporations, in case of suit, certain legal defenses, such as contributory negligence on the part of the employee, and the "fellow servant" defense, both of these, if proven, only tending to reduce the amount of damages the complainant can recover.

The law will cover, at first, only certain occupations, principally those classified as dangerous occupations. Mr. Falonie stated that electricity supply companies will come under this law, but only employees who are constantly subject to the dangers of the generation and transmission of electrical energy will be affected. Employees, such as inspectors, managers, etc., who are exposed to the alleged dangers occasionally, even if periodically, will not be allowed to participate in the benefits provided.

Speaking briefly of the features of the law, Mr. Falonie stated that the provisions specify payments ranging from $5.00 to $12 per week over a period of eight years in case of permanent injury. In case of death amounts ranging from $1,500 to $3,500 will be paid, in weekly installments, depending on the salary of the deceased. If the deceased leaves no one dependent upon him an amount sufficient to cover burial expenses is allowed. Various amounts are allowed for temporary injuries and hospital attention. In such cases the employee must, if so desired, submit himself to an examination by the employers' physician.

An arbitration clause in the law makes it possible for the family of a deceased to demand payment of a lump sum upon the death of a beneficiary in lieu of weekly payments, as already mentioned.

A feature of the law, the legality of which was questioned by the speaker, was the provision making an employer responsible for damages claimed by an employee of a contractor employed by the former, in the event of the insolvency of the contractor.

Mr. Falonie, in conclusion, criticized the lack of protection afforded employees in the case of insolvency on the part of the employer.

D. L. Gaskill, secretary of the Ohio Electric Light Association, was a guest of the club and spoke briefly of a Workman's Compensation and Liability Act recently passed in Ohio. He said that virtually the state is going into the liability insurance business under the direction of a Board of Liability Commissioners. All employers are invited to come under the provisions of the law and are then absolved from all liability.

From the central-station standpoint, however, Mr. Gaskill said that the rates are entirely too high, as a public-utility company suffers greatest from accidents to the public and seldom to its employees. The regular liability-insurance companies will not accept one class of insurance without the other; so central stations must of necessity remain with the latter.

Speaking of an investigation recently made by the Ohio Electric Light Association, Mr. Gaskill said that of premiums paid to liability-insurance companies by Ohio central stations only 20 per cent are returned in payment of damages. Fire-insurance conditions are even worse. From 61 companies reporting, $82,000 had been collected as premiums and only $60 returned for losses.

Oscar Olson, counsel for the Sanitary District, questioned the legality of features of the Ohio law. He also spoke of the peculiar situation in which the Sanitary District is placed, as it is a municipal corporation, and as such does not come under the Illinois law. However, it also engages in the generation, transmission and utilization of electric energy in competition with other corporations.

At the opening of the meeting President Gray announced that the Entertainment Committee was working on plans for an entertainment to be held on the evening of April 1. Chairman Hafner of this committee proposed holding an informal dance in the Masonic Temple.

The Philadelphia Electric Company Section.

The various Departmental Branches of the Philadelphia Electric Company Section of the National Electric Light Association, have displayed their usual activity during February. The members all seem to appreciate the necessity of getting together and discussing subjects that not only improve their general fund of information, but also their departmental usefulness.

The first meeting of the month was held by the Meter Department Branch, on February 8, and was devoted to "A Discussion of Distribution Problems."

Harold Goodwin, Jr., took up the subject of The Philadelphia Electric Company's practice covering primary and secondary systems of alternating-current distribution, taking up specific installations, involving interesting problems.

Frank Humphries's paper covered the construction of underground systems, paying particular attention to shapes of manholes, methods of making bends, conduit joints, etc, some of which were first developed by this company.

An exhibition of appliances, as well as practical demonstration, made both talks doubly instructive.

The General Section meeting of February 19, was to have been addressed by the late Caryl D. Haskins. In his stead the Section listened to an able talk on "Modern Methods of Securing Efficiency in Organizations, Having Special Reference to the Individual," by L. A. Osborne, vice-president, Westinghouse Electric and Manufacturing Company. Mr. Osborne has made a study of those fundamentals that are the root of individual efficiency, and his talk will unquestionably make for a fuller appreciation of health, which too many of us fail to realize the importance of, in our efforts toward attaining efficiency.

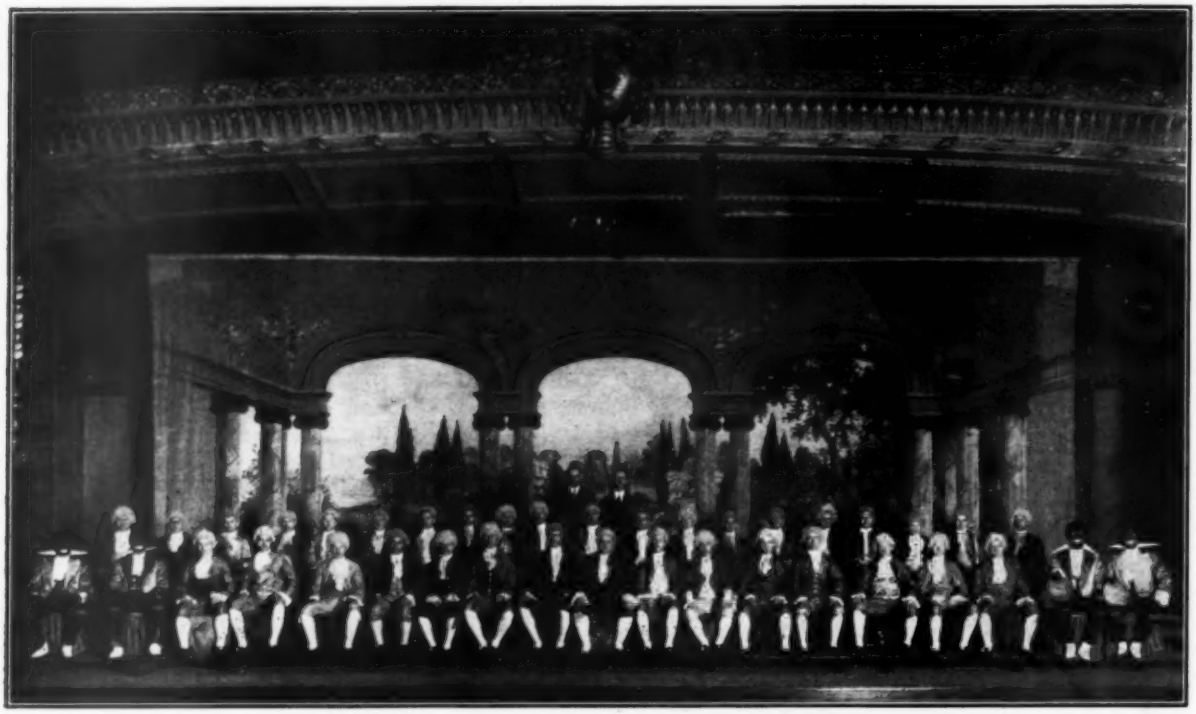
Mr. Osborne rightly contends that no permanent individual efficiency can be attained without giving careful and constant thought to our mental and physical health, husbanding and developing our physical resources in order to fully meet the ever increasing demands of modern business. Without efficiency in the component units, "organization efficiency" is, of course, impossible.

At the Commercial Branch meeting on February 26, A. L. Atmore of the Engineering Department, read a paper on "The Development of Personality as a Factor in Achieving Success." This was an admirable paper and apropos of the present time when we are constantly reminded of what the employee of the public-utility company should be and do, to promote and maintain cordial relations between his company and its customers.

The tactful, successful commercial man is one who, not by hypocricy, but through diplomacy and a well developed personality is "all things to all men." Such a man is a real business getter. Mr. Atmore very truly pointed out the fact that those employees availing themselves to the fullest of all the advantages of self-development constitute the successes.

The Colonial Minstrels of the Electrical League of Cleveland.

The group photograph herewith shows the Colonial Minstrels of the Electrical League of Cleveland, who participated so conspicuously in the welcoming of the Electrical Supply Jobbers' Association at the Valentine smoker and entertainment given at Gray's Armory on February 14. The minstrels are composed entirely of Cleveland men, and are for the most part members of the engineering department of the National Electric Lamp Association. Those participating in the minstrel show were as follows: Interlocutor, H. H. Cudmore; right end—W. E. Conley, Ben King, "Tambo's"; left end—Clark Baker, Wm. Michael, "Bones"; minstrels, Edmund Bailey, F. J. Blaschke, E. W. Bond, R. P. Burrows, C. A. Vavanaugh, Lloyd Clark, G. C. Conner, G. P. Cowan, J. C. Ford, Max Fuldauer, D. M. Gardner, W. B. Gilchrist, Ernest Hulland, R. B. Hunter, C. C. King, H. S. Lofquist, E. C. Lummis, H. C. Meredith, I. Owens, G. M. Rittenhouse, C. F. Sackwitz, R. W. Shenton, W. M. Skiff, H. A. Snow, H. Sotzen, H. T. Spaulding, C. R Stover, C. E. Terry, D. E. Vaughn, W. H. Webster, George Zerbes, S. H. Cudmore.



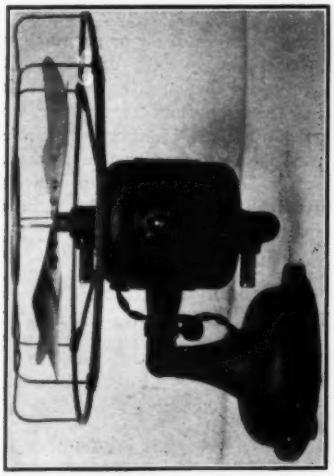
Colonial Minstrels of the Electrical League of Cleveland.

New Electrical and Mechanical Appliances

Crocker-Wheeler Electric Fans.

The first electric fan ever put on the market was built by the Curtis & Crocker Company. It was the invention of Schuyler Skaats Wheeler, who has been president of the Crocker-Wheeler Company ever since its foundation in 1888. Eighteen years later Dr. Wheeler was awarded the John Scott legacy medal and premium by the Franklin Institute for his electric "Buzz" fan.

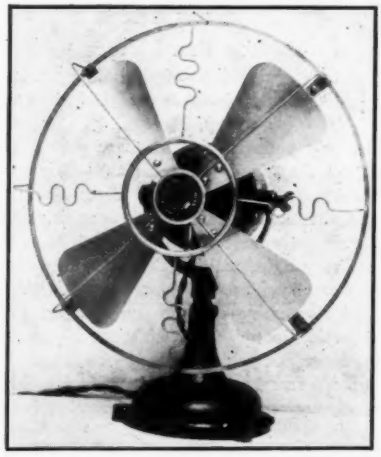
In 1912 the Crocker-Wheeler Company, Ampere, N. J., is putting on the market 9, 12 and 16-inch fans which are appreciably lighter and therefore more easily handled than other makes of corresponding sizes. Owing to the small size of the fan motors the Crocker-Wheeler fans will move more air, with the same consumption of energy, than those in which the larger motors impede the circulation of the air. The company has made tests in its laboratory on half a dozen different makes of fans of various sizes, and the above statement is based on the results of these tests. The nine-inch fan has an additional advantage in that the usual diameter of the smaller sized fans is eight inches. A fan with a greater periphery, running at the same speed, must perforce displace more air than a smaller machine.



Crocker-Wheeler Fan Arranged for Wall Mounting.

In appearance the fans are rich but quiet. The fans and fan guards are finished in polished and lacquered brass with the red and black enameled symbolical name plate in the center of the guard. The motor frames and stands or brackets are finished in a polished black enamel on the 12 and 16-inch sizes, and in a black lacquer on the 9-inch size. The fan guards are light and graceful in appearance, but strong enough so that the fan can be lifted by them without danger. Particular attention has been paid to making the shape of the blades such that they will move the greatest quantity of air consistent with noiseless operation and without expending too great an amount of energy.

The smallest size, intended to make only a light draft, is usually placed on desks or brackets in the office. For this reason the fans are arranged with a hinge joint immediately below the motor proper. This permits the motor with the fan to be tilted to that angle which blows the breeze in the desired direction. When adjusted at the proper angle the motor is held firmly in position by means of a wing screw. No swivel attachment is supplied, as these fans are so light it is much easier to turn them in the desired direction.



Crocker-Wheeler 16-inch Desk Fan, Non-Oscillating Type.

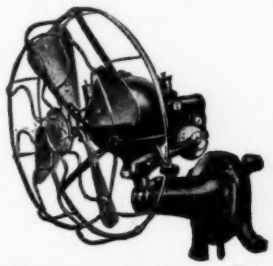
The two larger sizes are somewhat heavier, and are therefore provided with trunnion and swivel construction. The trunnion permits the fan to be tilted so that the breeze can be directed up or down. The swivel allows the direction of the breeze to be altered to the left or right. Both the trunnion and swivel are provided with wing screws. All of these fans can either be mounted on a flat surface, like the top of a desk, or fastened to the wall without the use of any additional parts. The 12 and 16-inch fans can also be furnished with an oscillating device.

The careful design of the construction of these fans is well worth describing. The journal boxes are self-alining and are lubricated by grease from wick-feed grease cups. These grease cups are accessible from the outside, and will hold sufficient lubrication for a season's use. To take up the thrust of the fan a ball bearing is provided at the end of the shaft opposite the fan. This prevents any wear on the ends of the journal boxes and prolongs the life of the fan. In the base of the motor is located a four-point switch by means of which three running speeds are secured in all the motors. Great care has been taken to insure quietness of operation. The motors are balanced to prevent the vibration which might cause a humming noise to be set up in the desk or wall to which they are attached. The fan blades are shaped so that they move the air gradually and without causing eddy currents or setting up vibrations.

These fans are kept in stock for 110-volt direct-current and 60-cycle alternating-current circuits.

Eck Hurricane Fans.

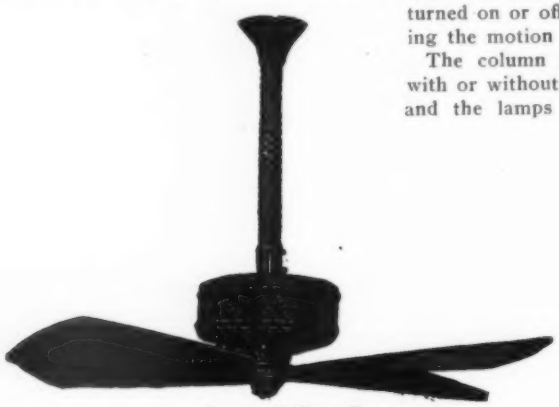
For some 17 years the Eck Dynamo & Motor Company, Belleville, N. J., has been manufacturing the Eck Hurricane desk fan. As a result of this experience these fans are now more reliable and serviceable than ever before. For this year's line, 8, 12 and 16-inch sizes have been standardized. All of the non-oscillating fans are made of the universal desk and bracket type and are rapidly adjustable for turning the fan in any direceion, or for wall mounting.



Eck Hurricane Oscillating Bracket Fan.

The oscillating fans are operated with a worm gear which is submerged in grease, thus reducing the friction element to a minimum. As an additional protection a friction disk is used in the gear wheel so that should the fan be prevented from oscillating the gears will not be

subjected to any excess stress. These fans oscillate at any of the three speeds that are usually provided with all of the Eck desk fans. The fans are made both for direct-current and for alternating-current circuits, but are not intended to be interchangeable. The voltages for which the fans are standardized are 100 to 125, and 200 to 250. A particularly compact design is the new eight-inch fan, which possesses graceful outlines and which is finished with a high gun-metal polish.



Bates Ceiling Fan.

Ceiling fans are made with 52 and 56-inch blades. The alternating-current fans of this class have either two or three speeds. All of these fans can be equipped for electrolier service. The company also makes a direct-current exhaust fan with either 12 or 16-inch blades. With these is provided a speed-regulating rheostat.

Bates Electric Fans.

The Bates electric fans, manufactured by D. L. Bates & Brother Company, Dayton, O., are wound for direct current only. This line includes the universal fan, 110, 220 and 500 volts, with 12, 16 and 20-inch blades. This fan can be used as a desk, trunnion or wall-bracket type without the use of extra attachments.

Dayton Six-Blade Residence Fan.

The style E ceiling fan motor is wound for 110, 167, 220, 250 and 500-volt circuits, and is furnished with or without switch or three-speed attachment.

The revolving electrolier fan makes an unusual appearance, especially if colored lamps are used. When the fan is in motion, the lamps revolve with the blades. The lamps may be turned on or off at will without affecting the motion of the fan blades.

The column fan may be furnished with or without electrolier attachment, and the lamps may be burned independent of the motion of the fan blades.

Dayton Fan Motors.

An extensive line of desk and ceiling fans is manufactured by the Dayton Fan & Motor Company, Dayton, O. A particularly popular type of these desk fans is the eight-inch fan for small-office and residence service. Both direct-current and alternating-current fans are made. As a rule these have three speeds. The fans are very light, making them readily portable, and yet are of rugged construction. The alternating-current fans are of the induction-motor type without the automatic cutout which has proven troublesome formerly. All of the desk fans are easily converted into wall or bracket fans. A six-blade residence fan has been found quite serviceable for securing a strong breeze without excessive speed. A special trunnion form of fan for direct-current circuits has a large angular adjustment.

The ceiling fans are made of the induction-motor or direct-current grammering type. Most of these fans operate at only the one speed which has been found most desirable for a particular purpose. Several of these types, however, are provided with triple-speed adjustment. Various lengths of ceiling blades are provided so as to secure a sweep from 32 up to 57 inches.

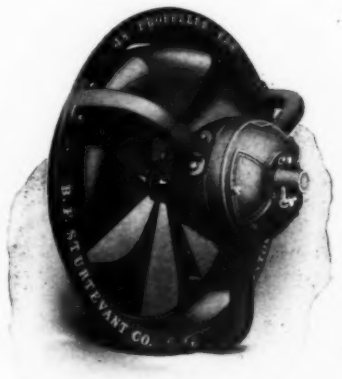
Sturtevant Electric Exhaust Fans and Blowers.

The B. F. Sturtevant Company, Hyde Park, Mass., is one of the oldest companies specializing in ventilating machinery, fans and blowers for all kinds of purposes. A complete line of electric blowers and propeller fans is manufactured by this company. They are made for either exhaust or pressure service. The electric centrifugal fans are made in three sizes delivering 150, 300 and 450 cubic feet per minute. Propeller fans are mounted directly in an opening with the motor carefully centered in a tripod. Large blowers and fans are made with steel-plate casings and in a great variety of styles and sizes, depending upon the service for which the blast is to be provided. The motors are mounted either directly on the case, being supported by brackets on one side or, in extra large machines, a separate pedestal is placed alongside of the case. For handling extra large volumes of air or gas, multivane fans have been specially designed. They are very compact and operate at high speed. An important service for which electrically driven blowers have come to be used is in the provision of mechanical draft for boiler furnaces, for which the Sturtevant Company provides a variety of equipment.

Dayton Ceiling Fan.

Lundell Electric Fans.

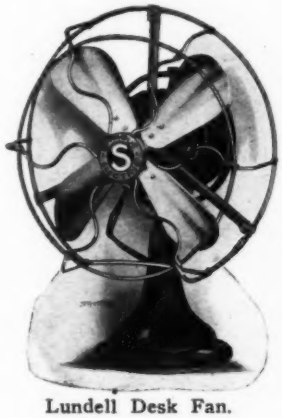
The Sprague Electric Works, New York, N. Y., is offering a complete line of Lundell direct and alternating-current fan motors. The line includes 8-inch desk and bracket fans, and 8-inch telephone-booth fans; 12-inch and 16-inch universal joint fans, and



Sturtevant Electric Propeller Fan.

universal joint oscillating fans; 12-inch and 16-inch Midget exhaust fans; six-blade exhaust fans; 12-inch exhaust fan blowers for furnaces; 32-inch Midget ceiling fans; 56-inch, four-blade, type T ceiling and column fans.

The Lundell non-oscillating fans, both 12-inch and 16-inch, for 1909 to 1912, inclusive, can be readily converted into oscillating motors by the addition of the Lundell oscillating mechanism outfit. The oscillating mechanism is controlled by an indicating knob mounted at the rear of the gear casing. Through the control of the indicator knob the fan can be made to oscillate or to become locked in a stationary position.



Lundell Desk Fan.

Fidelity Electric Fans.

The Fidelity Electric Company, of Lancaster, Pa., has made several additions and improvements in its line of electric fans. The standard desk fans are 12-inch and 16-inch sizes. A smooth base giving a higher finish is now used. The non-oscillating fans have either trunnion or swivel and trunnion adjustment. Alternating-current fans have a commutator which is free from sparking. The oscillating fans are operated by worm and gear. For ceiling service the fans are of two general types with the blades above or below the motor and with or without electrolier.

Fidelity Trunnion Desk Fan.

In the line of eight-inch fans the company makes four types. The combination stand fan has both swivel and trunnion motion and is adjustable to any angle and for bracket mounting. The eight-inch aluminum-frame socket fan weighs only 1.75 pounds and takes but 15 watts; it can be hung from any lamp socket supplied with alternating current. An eight-inch direct-current fan of special light weight is made to screw into any socket. The eight-inch telephone-booth fan can be suspended by springs from an ordinary coat hook. The company also makes a combination ten-inch fan and utility motor with a shaft extension on the opposite end from the fan for polishing and similar service.

Champion Electric Blacksmiths' Blowers.

The Champion Blower & Forge Company, Lancaster, Pa., has been manufacturing electric blowers for blacksmiths' use for many years, since it was one of the first concerns to appreciate the advantages of electric blast for the forge.

One of the most popular of the Champion electric forges is a combination electric and hand-power blower, the hand blast being used only when the power has been shut down. These machines are not equipped for variable-speed operation, but have a blast gate for adjusting the amount of air. Direct-connected blowers are made in two types, one serving up to four fires and another capable of supplying up to nine fires. These are of the constant-speed type provided with a Westinghouse motor, either direct or alternating current and of any voltage or frequency desired. Variable-speed blowers have been found very efficient in providing each forge with exactly the degree of blast that is required for a particular piece of work. These are usually equipped for supplying one fire. They have prompt and ready speed control and are made in various sizes for light, medium or heavy work.

Buffalo Blacksmiths' Blowers.

The Buffalo Forge Company, Buffalo, N. Y., has been one of the leaders in the manufacture of forges, blowers and other equipment for blacksmiths' use. In order to secure the most convenient form of blast for this service the adaptation of the electric fan was made many years ago. Now the use of electric blowers for this work has become quite common since their advantages are quite marked.

The Buffalo Forge Company has developed two distinct types of electrically-driven blowers, the constant speed and the variable speed. All of the forges that are equipped with electric blast can be provided with either the one or the other type of blower. These blowers are also capable of supplying more than one forge. The constant-speed blower is made for operating one up to five fires. The variable-speed motor is made for operating as many as three fires, but most commonly is used for individual service. In this connection it provides all of the advantages that individual motor drive does for any machine operation.

The variable-speed blowers have a six-speed regulator, which is separate from the motor and can be mounted conveniently for the blacksmith. The current taken by these motors is so small that they can be connected into any ordinary lamp socket. The variable-speed motors are entirely inclosed, thus protecting the windings from the influx of metallic or other dust. They provide a high blast pressure at relatively low speed. Constant-speed blowers are used in connection with an adjustable blast gate and are designed particularly for continuous and severe service.

Champion Variable-Speed Blower.

Buffalo Variable-Speed Blower.

Some of the electric forges are arranged on the down-draft principle which permits the removal of excess smoke by drawing it through the back part of the forge and forcing it through a special pipe through the fire a second time. This produces healthful working conditions and gives a clean appearance to the blacksmith shop.

Westinghouse 500,000-Volt Testing Transformer.

The accompanying illustrations show a 500,000 volt testing transformer recently built by the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., for insulation tests on high-voltage power transformers and other high-tension apparatus. Its design illustrates an ingenious handling of the problem of insulation, whereby this extremely high voltage is taken care of in a very satisfactory manner without increasing the amount of insulating materials used, or the bulk of the apparatus, to an excessive degree.

It will be seen that the transformer has only one high-tension terminal, the other end of the winding being grounded. As all insulation tests, almost without exception, can be made with one side grounded, this feature is not objectionable but on the contrary has many advantages. It will be noted that, with one end of the high-tension winding grounded, it is necessary to insulate the ungrounded end and also the high-tension terminal for the full transformer voltage. On the other hand, if the middle point of the winding were grounded and both ends brought out through insulted terminals, it would be necessary to insulate the ends of the winding and the terminals for only one-half the transformer voltage; for example, if the voltage between terminals is 750,000, it would be necessary to insulate the winding and terminals to ground for only 375,000 volts. From this, it will be seen that the insulation problem for the given terminal voltage is a much more difficult one when one end of the winding is grounded than when the middle point is grounded. On the other hand, a considerable proportion of the apparatus is under test to ground, and to make such tests with a transformer having the middle point grounded is most inconvenient because it necessitates the placing of the apparatus on a support insulated from ground for one-half the test voltage.

The problem of insulation is solved in an ingenious way. The insulation of the low-tension winding, and between high-tension and low-tension coils is a simple matter, accomplished by means of insulating cylinders. The high-tension winding is insulated from the core, not by interposing large masses of insulation, but by subdividing the high-tension winding and so connecting the coils that the coil with maximum potential to ground is located at the greatest distance from the yoke. This arrangement is shown in Fig. 2. The ungrounded end of the winding is at the middle of the column of coils. The coils placed nearer to the yokes are nearer the grounded end of the winding and their potential to ground correspondingly less. The coils at the grounded end of the winding practically touch the yokes. The distance of the coil from the yoke increases with its voltage above ground, and the potential gradient from the ungrounded terminal is therefore fixed and uni-

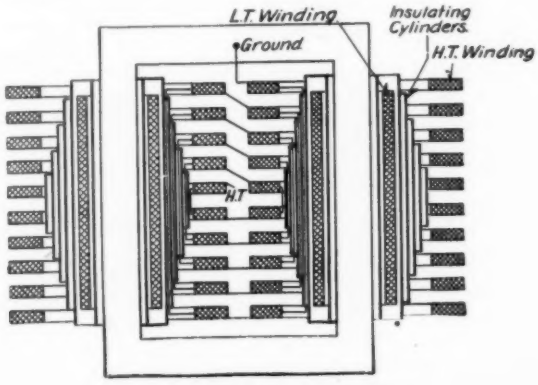


Fig. 2.—Winding Arrangement.

Fig. 1.—500,000-Volt Transformer Complete.

Fig. 3.—Transformer Without Case.

form. The windings of this transformer have developed a voltage of 600,000 without any sign of distress.

The high-tension terminal is of the condenser type, made of alternate layers of insulating material and tin-foil so proportioned in length and thickness that the potential gradient along the surface from line terminal to ground is approximately uniform. The large "hat" on top of the terminal is provided to prevent corona effect. The hat is made of wood, coated with tinfoil. Its effect is to make the static field from line terminal to ground uniform, and to prevent concentration of static field. Without the hat, corona was present at about 350,000 volts. With the hat there is no corona up to 570,000 volts.

Synchron Life-Saving or Artificial-Respiration Apparatus.

To recall an apparently dead person to life—the cause of the asphyxia may be drowning, poisoning by food or gas, electric shock—artificial respiration is generally used. At all events, when the organs of respiration have been put out of action, this is the only way of recalling the person to life. Artificial respiration is known by all experts as the hardest and most trying work. Considering the time during which success is possible, at least one hour, it is easily understood that the manipulator must be exceedingly strong. It has therefore long been the dream of practical people to devise some appliance that will carry out the operations with due precision and without undue exertion.

Dr. Fries, a Swedish physician, has invented a simple apparatus which reduces the work for the artificial respiration considerably. It has come triumphantly through severe tests at the Karolinska Institute, Stockholm, where J. E. Johansson, M. D., has carried out practical experiments in the physiological department; also at the Serafimerlasarett, or Royal Hospital of Stockholm, where it has been installed for general practice. The appliance has also been adopted by the Live Saving Society, and approved by the Directors of the Association of Swedish Physicians. At the Royal Hospital, Stockholm, this apparatus proved successful in several cases of asphyxia after manual treatment had been abandoned as hopeless.

The apparatus and its operation may be readily understood from the accompanying illustration. The injured person is placed on a board, which is raised a little at the head end, and the arms are strapped to the levers, the latter being made of ordinary pipe. Across the chest a girdle is placed, which serves to compress the chest and is connected with and operated by the levers. Wires running from the end of the levers through small pulleys are connected to the girdle by hooks. Several holes at each end of the girdle allow for adjustment.

Use of the Synchron Respiration Apparatus.

Referring to the illustration, it will be seen that the operator is holding out the tongue with one hand and operating the levers with the other. In this position the chest of the injured person is expanded to its fullest extent, no pressure being exerted by the girdle. In raising the levers the chest is compressed partly by the movement of the arms of the patient, but more by the pressure of the girdle, which is pulled down by the wires. The uniform movement obtained in moving the lever up and down is stated to have more beneficial effect than in manual operation. The apparatus can be managed by anyone and adjusted to different sizes. It gives better results as to the ventilation of the lungs than any other method, it is easily transportable and it is always ready for use. The apparatus is patented and is so simple and yet so effective that it should form an item in the equipment of every electrical generating station and every switch-room. It should also be an essential accessory in the equipment of every contractor, who undertakes tunneling and well-sinking work.

Thousands of this apparatus have been sold throughout Europe in the last few months. The sole representative in this country is A. E. Sylven, 29 Broadway, New York, N. Y.

C. & C. Motor in Good Condition After 22 Years of Steady Service.

An interesting case of exceptionally prolonged and reliable service recently came to light when a request was sent to a representative of the Power Bureau of the New York Edison Company to look over a motor in the plant of the Hartfield Telegraphic Code Publishing Company, New York City. Mr. Hartfield told the representative that the motor was beginning to give a little trouble and he thought that the commutator was a little worn. Upon inquiry it was found that the motor had been in continuous service since 1889, operating the presses of the company practically every day

The motor is a five-horsepower machine of the C. & C. type, which was purchased for $350 from the old Edison Electric Illuminating Company. Although rated at five horse power it actually has a capacity of fully seven. It is now working steadily again just as the day it was first installed. From that time to the present, including the last overhauling, which it received a few months ago, only $112 has been spent on it for maintenance and repairs of all kinds. This is a notable example of the ruggedness and reliability of the old C. & C. line of motors. These machines are now built by the Garwood Electric Company, Garwood, N. J.

Electric Mail Vans in Paris.

Paris will install about 160 motor vans in the postal service.

An electric vehicle is also on trial for collecting garbage, and if it proves successful horses will be entirely supplanted for this purpose.

Successful Test of Carbolineum in Preserving Telephone Poles.

The necessity for adopting positive measures for preserving poles is being more thoroughly recognized every day by all companies using overhead electrical transmission circuits in which wooden poles are employed. A large number of preservatives and preserving methods have been tried out with more or less satisfactory results. For small companies it is evidently impracticable to resort to any elaborate pressure-tank methods for injecting the preservative into the timber to be treated. Therefore the use of carbolineum is becoming more general, since this material is a refined and concentrated preservative which can be applied by the very simple brush method like ordinary paint.

A very interesting test of the use of this material has recently come to notice. The test was conducted by a western telephone company, which had determined to investigate the possibilities of extending the life of its poles. In June, 1899, 30-foot 7-inch top Michigan cedar poles which had been thoroughly air-seasoned were set on one of the company's lines which provided various conditions of moisture in different places. Three typical positions representing very dry, very wet and alternately wet and dry conditions were selected, and in each of these treated and untreated poles were alternately placed.

After a period of nearly 12 years these test poles were taken up and each one carefully examined. In each case representative samples had been selected. In the first location, where the poles had been set in the very dry ground, the treated pole was found to be in as good condition as the day it was set, while the untreated pole was seriously rotted from the ground line downwards. The two poles that were taken from the ground that was almost permanently wet showed very little deterioration.

The two telephone poles that were taken from the position that was alternately wet and dry are each shown in the foreground of the accompanying illustrations. The one marked No. 5, that is, the one that had not been treated, was found very seriously rotted in the part that was under the ground, as forcibly shown in the illustration. The rotting evidently had started from both the outside and the inside of the pole. Pole No. 6, which had been treated, suffered apparently no deterioration, notwithstanding that the carbolineum had not penetrated to the innermost recesses of some of the checks.

These poles had been treated by the brush method with merely one coat of Avenarius Carbolineum, which is marketed by the Carbolineum Wood Preserving Company, 318 Prairie Street, Milwaukee, Wis. This material has been used abroad for a very long time, the street-railway system of Berlin having employed it continuously since 1873 for the treatment of wooden ties, fences, construction sheds, poles, etc.; the results obtained in all instances have been very good.

This variety of carbolineum preservative has found very extensive use in the treatment of ties by the dipping or open-tank process. This method is also particularly suitable for the treatment of pole butts. However, as shown by the test referred to, excellent results have been obtained with the simple brush method; two applications are recommended ordinarily. At the recent convention of the National Independent Telephone Association during a discussion on preserving telephone poles this material was highly commended, a number of speakers having found very satisfactory experiences with but a single application of it with the brush to the butt end of the pole.

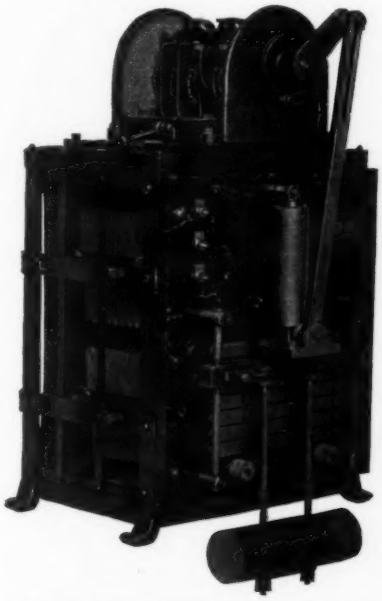
Appearance of Untreated Pole After Some 12 Years' Service.

Appearance of Treated Pole After Same Service Under Same Conditions.

Elevator Controller for Slip-Ring Induction Motors.

A new form of controller for slip-ring induction motors in connection with elevator service has been manufactured by the Independent Electric Manufacturing Company, Milwaukee, Wis. It is designed for two or three-phase motors. A slip-ring induction motor is particularly serviceable for alternating-current elevator service. Its starting torque is high, so that a smaller motor than of the squirrel-cage type can be used. Its power-factor is also very high.

These controllers have a three-pole combined line and reversing switch of the drum type, which is mounted on the top of the rheostat and connected into the stator circuit of the motor. A shaft extension of the drum is connected with the operating cable or



Independent Elevator Controller for Slip-Ring Motors.

other mechanical connection to the elevator car.

The resistance commutator is arranged to control noninductive grid resistances in each phase of the rotor circuit. A contact-making crosshead of substantial construction carries the brushes and slides up and down on two heavy guide rods. It is controlled from the reversing switch by a crank and connecting rod. When the operator desires to stop his car the crosshead is raised freely, thus introducing resistance in the rotor circuit and slowing down or stopping the motor. In accelerating the motor, however, the cutting out of resistance is controlled by an air dashpot so as to prevent too rapid acceleration and overload on the motor. The contact blocks and brushes are all equipped with renewable segments and the brushes are freely adjustable. All operating parts of the controller are readily accessible and are designed to withstand the most severe service.

Rapid Restoration of Service After a Telephone Exchange Fire.

On Sunday morning, January 14, Birmingham, Ala., was visited by a disastrous fire which completely wrecked the four upper floors of the building of the Southern Bell Telephone & Telegraph Company on Second Avenue and also destroyed a five-story building adjoining. As a result of this, the entire toll switchboard, used for long-distance connections and located on the fifth floor, became a complete loss, presenting a picture of warped iron work, molten copper and charred wood. The third, fourth and sixth floors were a mass of charred furniture and burnt papers, many records having been destroyed by the flames. The local switchboard and the associated frames and racks on the second and first floors, respectively, were not visited by the fire, but some damage was done by the water coming through from the other floors.

Within five hours after the fire started a representative of the Western Electric Company left Atlanta in company with officials of the telephone company. Immediately upon arrival at Birmingham, a survey was made of the gutted building, and it was decided to get together emergency switchboard equipment so that toll service could be restored, while pumping operations were begun to get the great volume of water out of the first and second floors. Telephone communication was established with the Hawthorne, Ill., factory of the Western Electric Company the same afternoon with the result that within 48 hours a complete new toll switchboard equipment, consisting of eight two-position sections with miscellaneous cable, was shipped by express to the scene of the fire.

Meanwhile an installing force was put to work on Monday morning, January 15, at 6:30 a. m. to assemble the temporary toll equipment forwarded from Atlanta and by 1:30 p. m. of the same day, toll communication was restored in temporary quarters obtained for that purpose. Owing to the damage done to the local-switchboard equipment, a considerable amount of work was necessary; but by January 23, 70 per cent of the local service was restored and the remainder on the following day.

The new toll switchboard arrived in Birmingham promptly, having left Hawthorne, Ill., on Monday morning, January 15, at 2:40 o'clock, and by dint of hard, rapid and careful work was put into service on Monday morning, January 29, at 2 o'clock, giving the telephone company a new, up-to-date toll equipment in fifteen days.

That so much was accomplished in so short a time is due to the untiring efforts of the plant department of the Southern Bell Telephone & Telegraph Company and of the Western Electric Company's force concerned in forwarding and installing the new equipment.

Gasoline-Electric Tool Car for Railroad Track Work.

The latest thing in railroading is the use of a gasoline-electric tool car which is really a gasoline automobile running on the rails like a hand-car and carrying an electric generator to operate the electric tools which have to a great extent superseded manual track labor on the Rock Island Railroad. The motive power for the car is supplied by a 30-horsepower gasoline engine, and the electric power is furnished by a 6.5-kilowatt Crocker-Wheeler generator. The electric tools which it is designed to operate are two electric spike-screwing machines, six electric drills, an electric saw for rails, and portable emery wheels. This is the equipment carried on each car.

If necessary this railroad automobile can pull additional cars of tenders to carry spikes, extra cable, or additional tools and men. It has been found that softwood ties can be utilized with the same degree of safety as hardwood by using screw spikes, and curve troubles are also largely eliminated thereby. The constant replacing of loosened spikes in ties is avoided, and there is consequently less rotting of ties caused by spike holes and practically no splitting of the ties from driving the spikes. Extra lengths of cable are carried with plug-in switches every twenty feet so that the electric tools can be used as far as a quarter of a mile from the car. Thus repairs can be effected promptly and at high speed.

A New Electrically Operated Calculating Machine.

Among the patents issued by the United States Patent Office on February 27 one that was particularly unique was a patent on a calculating machine granted to Alfred S. McCaskey, of Chicago. The machine is electrically operated and is of rather intricate construction, as is indicated by the fact that the patent covers 198 claims of the inventor. It took nearly nine years to get the patent through the Patent Office, the original application having been filed May 19, 1903.

Latest Approved Fittings

The electrical fittings illustrated and described in this department have been approved by the Underwriters' Laboratories, Incorporated, following examination and tests conducted under standards of the National Electrical Code as recommended by the National Fire Protection Association.

EDISON BUSINESS PHONOGRAPH.—Thomas A. Edison, Inc., Orange, N. J.

"Edison Business Phonograph" for use on 110-volt and 220-volt direct-current and 110-volt, 25, 40, 60 and 133 cycles and 220-volt, 60 cycles alternating-current circuits. Current required is one-fifth to one-fourth ampere.

A steel case incloses a special motor which drives a recording and reproducing phonograph mounted on the top of the case. An inclosed adjustable resistance and a special switch are provided as parts of the device.

Approved January 15, 1912.

RECEPTACLES, STANDARD.—The Perkins Electric Switch Manufacturing Company, Bridgeport, Conn.

"Perkins" Brass Shell Wall Sockets. for use with "Lutz" metal moulding.

Key, catalog Nos. 4526, 4528, 7526, 7528.

Keyless, catalog Nos. 7527, 7529.

Also connecting block for two-way bases, catalog No. 405.

Also all the above types with shade-holders attached, key type with composition or insulated metal key.

Approved January 29, 1912.

WIRES, RUBBER-COVERED.—Rubber-covered wires conforming to the specifications of the 1911 edition of the National Electrical Code and properly labeled by the Underwriters' Laboratories are now supplied by the following manufacturers:

American Steel & Wire Company, Worcester, Mass.

Marking: Soft woolen thread embedded in rubber lengthwise of wire and under braid.

Approved February 2, 1912.

Atlantic Insulated Wire & Cable Co., 120 Liberty Street, New York, N. Y.

Marking: Green and black threads crossing in braid.

Approved February 2, 1912.

Bishop Gutta-Percha Company, 420-430 East 25th Street, New York, N. Y.

Marking: One green cotton thread running parallel with wire between the rubber insulation and the braid.

Approved January 4, 1912.

Boston Insulated Wire & Cable Co., Dorchester District, Boston, Mass.

Marking: One coarse uncolored thread woven in braid.

Approved February 2, 1912.

Bourn Rubber Company, Providence, R. I.

Marking: Three green threads parallel in braid.

Approved February 2, 1912.

Detroit Insulating Wire Company, Wesson Avenue and Albert Street, Detroit, Mich.

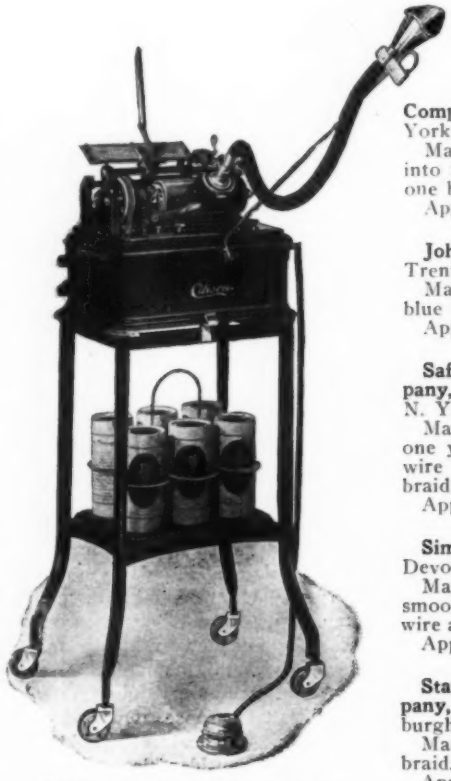
Marking: Three uncolored cotton threads parallel with conductor between the insulation and the braid.

Approved February 2, 1912.

Crescent Insulated Wire & Cable Co., Trenton, N. J.

Marking: Red and green threads crossing in braid.

Approved February 2, 1912.



Edison Business Phonograph.

General Electric Company, Schenectady, N. Y.

Marking: Red and black threads woven parallel in braid.

Approved February 2, 1912.

Habirshaw Wire Company, Yonkers, N. Y.

Marking: Three blue threads parallel in braid.

Approved January 4, 1912.

Hazard Manufacturing Company, Wilkesbarre, Pa.

Marking: Red and green threads parallel in braid.

Approved February 2, 1912.

Indiana Rubber and Insulated Wire Company, Jonesboro, Ind.

Marking: Two red threads parallel in braid.

Approved January 10, 1912.

Kerite Insulated Wire & Cable Co., 30 Church Street, New York, N. Y.

Marking: Green and black threads parallel in braid.

Approved January 20, 1912.

Marion Insulated Wire & Rubber Co., Marion, Ind.

Marking: Two green threads crossing in braid.

Approved January 20, 1912.

New York Insulated Wire Company, 114 Liberty Street, New York, N. Y.

Marking: Two black threads woven into the braid, crossing each other, or one black thread woven into the braid.

Approved January 4, 1912.

John A. Roebling's Sons Company, Trenton, N. J.

Marking: One red thread and one blue thread woven in the braid.

Approved February 2, 1912.

Safety Insulated Wire & Cable Company, 114 Liberty Street, New York, N. Y.

Marking: Seamless insulation and one yellow thread parallel with the wire between the insulation and the braid.

Approved January 10, 1912.

Simplex Electrical Company, 201 Devonshire Street, Boston, Mass.

Marking: Red cotton thread upon smooth rubber surface lengthwise of wire and under braid.

Approved January 4, 1912.

Standard Underground Cable Company, Westinghouse Building, Pittsburgh, Pa.

Marking: Green thread woven into braid.

Approved February 2, 1912.

Waterbury Company, 80 South Street, New York, N. Y.

Marking: Two black threads parallel with wire between rubber insulation and braid.

Approved February 2, 1912.

Current Electrical News

LIGHTING AND POWER.

(Special Correspondence.)

FREMONT, O.—The special Light Committee will soon ask for bids for arc lamps.

MINNEAPOLIS, KAS.—This city proposes to establish a $15,000 electric light plant.

NORTHWOOD, N. D.—The council contemplates the construction of an electric light plant. C.

ELY, IOWA.—The town of Ely is figuring on the installation of electric lights in the near future.

VALLEY CITY, N. D.—The Commercial club is discussing the cost of installing cluster lights. C.

WALTERBORO, S. C.—The town contemplates installing an electric light plant. Address the town clerk.

LINDSAY, CAL.—C. B. Morganthaler has been granted a franchise to operate a power line in this city.

KANSAS CITY, MO.—The Baker Electric Company has been incorporated with a capital stock of $5,000.

TIMPSON, TEX.—The Timpson Light & Power Company has been incorporated with a capital stock of $5,000.

EL RENO, OKLA.—The El Reno Gas & Electric Company will extend its lines to Darlington, Fort Reno and Yukon.

HOLYOKE, MASS.—It is said that Holyoke will expend $150,000 in improvements to its gas and electric plants.

WHIGHAM, GA.—An electric light plant will soon be constructed at Whigham. Mayor A. Harrell is at the head of the project.

CENTERVILLE, MD.—The legislature has authorized the construction of a municipal electric light plant. Address Town Clerk.

SHELLROCK, IOWA. — William Richards has purchased the electric plant of Toll & Betts, and will make various improvements. C.

ATWATER, CAL.—The San Joaquin Light & Power Company is preparing plans to extend its power line to the Atwater district.

RED LAKE FALLS, MINN.—The Red River Power Company has been granted a five-year franchise to supply electric light and power. C.

TULARE, CAL.—Bids will be received up to March 11 for the sale of a thirty-year franchise for furnishing the city with electricity.

WHITAKERS, N. C.—The city has voted a $10,000 bond issue for establishing an electric light plant. J. O. Hearne may be addressed.

BELLINGHAM, WASH.—An electric light franchise has been granted to W. H. Waples, and another to the firm of Smith, Kerry & Chace.

ATCHISON, KAN.—The City Council has passed an ordinance providing for a bond election to erect a municipal lighting plant, at a cost of $125,000.

GLENDALE, CAL.—The lights in West Glendale, for which $40,000 bonds were voted a short time ago, will be installed as soon as the bonds can be sold.

CAPE GIRARDEAU, MO. — The City contemplates the construction of an electric light plant and waterworks system. George E. Chappell is city clerk.

COUNCIL BLUFFS, IOWA.—The City Council has approved the recommendation for flaming arc lights to be installed in several streets in Council Bluffs.

SCRANTON, PA.—The Ozark Power & Water Company will develop a 15,000-horsepower hydroelectric plant on the White River in Southwestern Missouri.

KINGWOOD, W. VA.—Cheat Valley Power & Electrical Company has been incorporated by Julius K. Monroe and associates to build a waterpower electrical plant.

NAPA, CAL.—The Great Western Power Company has asked for a franchise to operate in Napa County. Bids for the sale of said franchise will be opened April 9.

TACOMA, WASH.—The city lighting plant distributing system will be rewired this year to care for the current generated by the new Nisqually municipal project.

HARTFORD CITY, IND.—J. N. Trout, city clerk, is asking for bids for the installation of two 100-horsepower steam boilers in the municipal electric light and water plant. S.

CHINOOK, MONT. — The town clerk will receive bids until March 11 for furnishing and setting electroliers, cement and curb work, etc., for the remainder of the year. C.

SOUTHPORT, N. C.—The Southport Light & Power Company has been incorporated with a capital stock of $50,000 by H. K. White, C. Ed Taylor and Henry B. O'Hagan.

SIERRA MADRE, CAL. — The Southern California Edison Company has purchased a lot on Bonita Avenue for the purpose of installing a substation for its power system.

FULTON, O.—Fulton Electric Light & Power Company has been incorporated with a capital stock of $10,000. The incorporators are John Howell Hooks, E. B. Wade and M. E. Wade.

LOCKPORT, N. Y.—Lockport is contemplating the adoption of a municipal-government plan of electrolier street lighting. F. C. Stevens, Lockport, is interested in this move.

VACAVILLE, CAL.—The Vacaville Water & Light Company has been granted a temporary permit to maintain a power line along certain described roads in Vacaville Township.

LIBERTY CENTER, O.—The Liberty Light & Power Company has been incorporated with a capital stock of $6,000 for the purpose of furnishing electricity for light, heat and power purposes.

LONDON, ONTARIO.—The London Street Railway Company has issued instructions to Manager King to call for tenders on the installation of a steam plant for the manufacture of electricity.

LEONARD, TEX.—The Leonard Ice & Light Company has been incorporated with a capital stock of $25,000. The incorporators are H. T. Weathers, J. C. Christian, J. E. Wilson and E. S. Collins.

FITCHBURG, MASS. — Mayor Hardy and the Finance Committee has in hand the matter of installing a new system of street lighting, which it is contemplated would cost in the neighborhood of $3,000.

BISHOPVILLE, S. C.—The city contemplates installing a 125-horsepower boiler in the electric light plant. It is also proposed to use tungsten lamps for street lighting. S. P. Sutton is the superintendent.

SAN JACINTO, CAL.—Bids will be received up to March 28 for the purchase of a five-year franchise granting the right to maintain an electric pole, tower and wire system along all public streets of the city.

BIG FALLS, MINN.—Albert Shipley, Virginia, Minn., represents capital that will build a buttmill here and install an electric light system for their own use, and are also after a franchise to furnish the village with electric lights.

LAMONI, IOWA.—The Herald Publishing House, which owns the local electric light plant, contemplates the building of a transmission line to Kellerton, a distance of 12 miles. F. B. Blair is manager of the electric light plant.

ALLIANCE, O.—The Bailey Engineering Company has been drawing plans and making specifications for a tungsten incandescent lighting system for Alliance, which will require over 600 tungsten lights. The town will ask for bids soon.

OAKES, N. D.—Dr. Blakeslee has duly signed and transmitted a $5,000 bond to the city authorities and will proceed to install an electric light and power system in this city. It will be a storage battery plant and is to be running by June 1, 1912.

SCOTT, KANS.—An electric light franchise has been granted to J. W. Lough and Chicago parties composing the irrigation and development company which is represented here by Mr.

Lough. This means that an electric power plant will be installed here at a cost of $100,000.

KINGSVILLE, TEX.—The Kingsville Power Company will construct an extensive system of electric power transmission lines through the irrigated territory around Kingsville for the purpose of operating pumping plants upon a number of wells. A. L. Kleberg is manager of the company.

HOUSTON, TEX.—It is stated that larger and better industrial plants will replace those destroyed by the fire here. Among the plants burned were those of the Houston Light & Power Company, Southwestern Telephone Company, Houston Gas Company, Houston Electric Company and Home Telephone Company.

COVINGTON, IOWA. — Theodore Kluemper, president of the Board of Council, presented a resolution at a recent meeting of the Board that Mayor George E. Phillipps be empowered to appoint a committee of three to investigate the feasibility of a municipal electric light plant. The resolution passed without a dissenting vote.

NESQUEHONING, PA.—The Lehigh Coal & Navigation Company has decided to erect a power plant at the north end of the Tauto Tunnel. The undertaking represents an outlay of $3,000,000. It is expected the plant will be completed by 1913 and ready to furnish light, heat and power to the various cities in the eastern part of this state as well as to New York City.

HINTON, W. VA.—The West Virginia Power Company, which has been incorporated with $5,000,000 capital stock, plans to build a hydroelectric plant at Sandstone Falls of New River, near Hinton. The incorporators of the company are T. Brady, New York; Fred Auld, Charleston, W. Va.; Sumner Ford, Brooklyn, N. Y.; E. H. Pitney and Lester C. Burdette, New York City.

FLANDREAU, S. D.—The Flandreau Light & Power Company has filed articles of incorporation with a capital stock of $50,000 and propose to construct about 20 miles of power line to supply electricity to the towns of Flandreau, Egan, Trent, Dell Rapids and Baltic. The incorporators are Charles C. Ladd, Osceola, Wis.; Arthur H. Savage, St. Paul, Minn.; and J. M. Bennett, Flandreau.

LAFAYETTE, IND.—The Indiana Gas & Electric Transportation Company, with an initial capital stock of $150,000, has filed articles of incorporation with the Secretary of State. The declared object of this company is to manufacture and supply electricity for heat, light and power purposes to a large number of cities. The principal place of business will be in Lafayette with branch offices in the field to be served. The incorporators are A. E. Scheithe, B. P. Shearron and L. E. Waters. S

MONTEREY, MEX.—The Compania Hidro-Electrica Mexicana, which was organized in Canada a short time ago with a capital stock of $15,000,000, has finished making the surveys for its three proposed hydroelectric plants that are to be installed in Northeastern Mexico. One of the plants will be located on the Narangos River near Micos and the other two on the Blanco River. The three plants will generate approximately 100,000 horsepower. Transmission lines will be constructed to Monterey, Saltillo, San Louis Potosi, Tampico, Victoria, Linares and other places. D.

COLUMBUS, TEX.—O. A. Zumwalt, E. A. Hutchins ond C. E. Sour, Columbus, are promoting the construction of a dam across the Colorado River near here and the installation of a hydroelectric plant. Preliminary surveys show that by the construction of a 22-foot dam, 2,400-horsepower can be developed. It is planned that this power shall be used for operating the proposed electric railway that is to run between Brenham and Columbus *via* Industry and New Ulm, a distance of about 40 miles. The surplus power will be used for operating irrigation pumps and various kinds of industries in this section. Transmission lines will also be constructed to a number of towns. D.

TELEPHONE AND TELEGRAPH.

(Special Correspondence.)

MULLIN, TEX.—The West Texas Telephone Company is about to erect an exchange building.

STRIP, MINN.—The New Solum Telephone Company will extend its line from Anita to Strip. C.

LITTLE FALLS, MINN. — The council is considering the installation of an electric fire-alarm system. C.

CENTER CITY, MINN.—The Chicago County Telephone Company will erect an exchange building here.

ROANOKE, ILL.—It is reported the Roanoke Telephone Company has decided to install a new switchboard.

MOUNT HOPE, KANS. — The Mount Hope Telephone Company has been incorporated with a capital stock of $1,500.

CURTIS, NEB. — The North Star, Sheridan & Curtis Telephone Company has been incorporated by R. A. Wilson and others.

LONGVIEW, TEX.—The Lacey Telephone Company has been granted a 25-year franchise for a telephone exchange and system here. D.

BAGLEY, MINN.—The central office of the Bagley-Ogema Telephone Company, which was destroyed by fire, will be rebuilt this spring. C.

GEORGETOWN, CAL.—A farmer's telephone line is to be erected between here and Slatington by the residents of the Drytown section.

ORANGE, TEX.—The Southwestern Telegraph & Telephone Company, Dallas, Tex., will construct a telephone system from Orange to Newton.

BIRMINGHAM, ALA.—It is reported that the Seaboard Air Line Railway will install a telephone-dispatching system on the Birmingham Division.

INTERNATIONAL FALLS, MINN. —The International Lumber Company will build a telephone line from here to Bemidji, and another to Virginia.

McEWEN, TENN.—A rural telephone system which will accommodate 100 farmers is being agitated here to extend down Hurricane and Blue Creeks.

RULEVILLE, MISS.—The Burl Bayou Telephone Company has been incorporated with a capital stock of $10,000 by J. W. Riddell, T. B. Brown and others.

WELWYN, SASK.—H. Bayless, secretary-treasurer, will receive bids until March 15 for building 15 miles of telephone line for the Ferndale Telephone Company. C.

VERMONTVILLE, MICH. — The Farmers' Independent Telephone Company has procured a charter and issued stock. Building operations will be commenced in the spring.

BIG WELLS, TEX.—The Del Rio & Western Telephone Company is erecting a two-story exchange building here and is constructing new lines between this place and Crystal City.

OZONA, TEX.—W. E. Bennett & Sons have sold their telephone exchange at this place to Fort Stockton men. It is stated that the new owners will extend the lines to a number of points in this territory. D.

MANCHESTER, N. H.—The New England Telephone Company has been granted permission by the Board of Public Works to construct underground conduits for its wires in certain streets of this city.

DEL RIO, TEX.—Lew Rust, manager of the Del Rio Telephone Company, announces that the long-distance line which now runs to Comstock will be extended to Langtry and a number of ranches in that section. D.

CARMINE, TEX.—The Farmers' Rural Telephone Company has been formed here for the purpose of constructing and operating a rural telephone line. The incorporators are Ad Giessel, E. E. Wolle, Charles Enrich and others. D.

WHITE ROCK, MINN.—G. O. Miller Telephone Company has been incorporated with a capital stock of $50,000. The incorporators are G. O. Miller, A. L. Swenson, E. T. Swenson, Fred Swenson, Andrew J. Larson, A. W. Carlson.

BOYCE, TEX.—W. B. Kidd is erecting a telephone exchange building here and will install first-class equipment and make important improvements to the local telephone system. Long distance lines will be built to Waxahachie. D.

HAMMON, OKLA. — The Moad Telephone Exchange of Hammon, Okla., has been incorporated with a capital stock of $6,000. The incorporators are J. A. Moad, Hammon; William G. Moad, Carpenter, and J. S. Moad, Hammon.

ALTAVISTA, VA.—Altavista Telephone Company has been incorporated with a capital stock of $15,000. W. B. Elwood, Centerville, Ind., is president of the new company; Fred E. Teas, Centerville, Ind., vice-president; G. R. Jordan, Altavista, secretary-treasurer.

KENDALLVILLE, IND. — The Home Telephone Company has just completed improvements costing $10,000, and will begin work in the spring on a $20,000 cable from Kendallville to Goshen. This will require an entire new set of poles and a large amount of wire, equipment, etc. S.

DEMING, NEW MEXICO.—The Luna County Telephone Association has been formed here for the purpose of constructing a telephone system to different parts of the county. The officers are Hugh Ramsey, president; A. V. Wilkerson, vice-president, and Frank Barrett, secretary and treasurer. D.

ELECTRIC RAILWAYS.

(Special Correspondence.)

MESA, ARIZ.—The Salt River Valley Electric Railway Company has been granted a 25-year street-railway franchise in this city.

DECATUR, ALA.—The Development Company of Decatur has in hand the matter of building a trolley line between Decatur and Huntsville.

GLENDALE, CAL.—Bids will be received up to April 1 for the purchase of a 44-year franchise for an electric railroad on certain public streets of the city.

ROCHESTER, IND.—George W. Holman and others are promoting an electric line between this city and Akron, where it will connect with the Winona line. S.

MECHANIC FALLS, ME.—It is rumored that the electric road which has its terminus here will be extended through Oxford to South Paris and Norway.

ALBERT LEA, MINN.—The proposed electric line between here and Sioux Falls, S. D., will run through Worthington, Wilmot, Lismore, Kenneth, Luverne and Hills. C.

SAN DIEGO, CAL.—It is stated that E. L. Doheny and C. A. Canfield, Los Angeles oil operators, are interested in the proposed San Diego, El Cajon and Escondido electric line.

WAVERLY, N. Y.—It is rumored that an official of the Erie Railroad Company has announced that his company would build a trolley line this summer from Waverly through Owego to Binghamton.

BOZEMAN, MONT.—Surveyors have been at work running a preliminary route for an electric railroad from the mouth of Dry Creek to Bozeman, a distance of about 10 miles. The right of way has been secured.

IOWA CITY, IOWA.—The officials of the Iowa City-Ottumwa and the Iowa City-Davenport interurban lines, state that these lines will be built despite the recent decision of the Supreme Court limiting bonded indebtedness to $16,000 a mile. C.

ST. AUGUSTINE, FLA.—Plans are under way for the extension of the street-car service of the St. Johns Electric Company to be extended to include New Augustine and the South Beach division, where the Methodist summer chautauqua will be established.

ATLANTA, GA.—William F. Parkhurst, representative of the Georgia Power Company, has announced that a survey will be made at an early date for the trolley and power transmission line connecting Macon, Atlanta, Augusta, Columbia, Columbus and other Georgia cities.

SAN FRANCISCO, CAL.—The Masonic Avenue car line will be extended from its present terminus out Judah Street to Ninth Avenue and thence to Pacheco Street. The property owners have subscribed $20,000 as part of the necessary funds for the construction of the road.

GETTYSBURG, PA.—The Hanover & McSherrystown Street Railway Company, it is said, is planning the extension of its trolley line from Hanover to Gettysburg, and it is believed that work will be commenced in the spring. The distance of this extension is about 11 miles. It is also proposed to build a branch to New Oxford.

WATERVILLE, ME.—A permanent association with the following officers has been formed for the purpose of attending to the preliminary matters pertaining to a proposed trolley line to run between Fairfield Center and Waterville: President, J. N. Snow, North Fairfield; secretary, J. A. Jones, Fairfield Center; treasurer, H. L. Holt, Fairfield Center.

LARNED, KANS.—The State Charter Board has granted a charter to the Hutchinson & Western Interurban Railway Company, capitalized at $1,000,000, to build an interurban line from Hutchinson to Larned, a distance of 90 miles. E. Bardbridge, C. F. Bunte, W. A. Koor, B. E. Giles, T. Blackmore and F. P. Roher, Hutchinson, and A. C. Wheeler of Garden City are the incorporators of the company.

BROWNSVILLE, TEX.—The Brownsville Street & Interurban Railway Company has been organized for the purpose of constructing a street-railway system at Brownsville. The company has taken over the franchise that was granted recently to S. A. Robertson of San Benito. Its capital stock is $10,000. The incorporators are S. L. Dworman, Brownsville; H. L. Borden, Houston, and S. A. Robertson. D.

HOPKINSVILLE, KY.—The Kentucky-Tennessee Traction Company has filed articles of incorporation with a capital stock of $1,000,000 for the purpose of building an interurban electric line from Hopkinsville to Guthrie. The officers of the company are as follows: Nat Gathers, Hopkinsville, president; J. W. Cross, Pembroke, vice-president; H. A. Keach, Hopkinsville, secretary; A. H. Eckles, Hopkinsville, treasurer.

PROPOSALS.

MOTOR-DRIVEN SEWING MACHINES.—Proposals will be received until April 2 by the Navy Department, Bureau of Supplies and Accounts, Washington, D. C., for three motor-driven sewing machines to be delivered at the Navy Yard, Brooklyn, N. Y.

TURBINES, PUMPING SETS AND ELECTRIC PLANT.—Sealed proposals will be received at the United States Engineer Office, Mississippi River Commission, First and Second Districts, Memphis, Tenn., until March 26 for furnishing turbines, pumping sets, boilers and electric light plant. Information on application.

SWITCHBOARDS.—Sealed proposals will be received at the office of the Chief Signal Officer, War Department, Washington, D. C., until March 12, under Proposal 575, for furnishing two switchboards, local battery, unit type, capacity 100 lines; and four switchboards, local battery, unit type, capacity 50 lines. For further information address J. R. Burt, captain, signal corps, U. S. Army, disbursing officer.

ELECTRIC CONDUITS AND WIRING AND LIGHTING FIXTURES.—Sealed proposals will be received at the office of the Supervising Architect, Washington, D. C., until April 2 for electric conduits and wiring and interior lighting fixtures of a one-story and basement building for the post office at Mattoon, Ill.; until April 4 for electric conduits and wiring and interior lighting fixtures of a one-story and basement building for the post office at Steelton, Pa.; until April 8 for electric conduits and wiring and interior lighting fixtures of a one-story and basement building for the post office at Westerly, R. I. Drawings and specifications may be had from the custodian of the various sites or from the office of the Supervising Architect.

FOREIGN TRADE OPPORTUNITIES.

(Parties interested in the following items should address the Bureau of Manufactures, Washington, D. C., and refer to the file number noted.)

No. 8161. ELECTRICAL WORK.—An American consul reports the following electrical works to be undertaken in the country in which he is located: (1) A company will establish a hydroelectric and steam power plant of 600 horsepower for the generation of electricity. An electrical power plant using steam as a motive power will also be established by the same company. Lignite will be the fuel for the two steam plants. This company absorbs the interests of several small electrical concerns, with a substantial increase in the cash capitalization. (2) A concession has been granted to a company for the establishment of an electrical plant to transmit electricity for light and power to certain cities. (3) A concession has been granted to an organization to establish an electrical plant to transmit electricity to a certain city. Names of these various companies can be obtained from the Bureau of Manufactures.

No. 8163. ELECTRIC PLANT.—The borough council of Poplar, E., London, England, contemplates the extension of the plant at its electricity station, at an estimated cost of $102,196.

No. 8166. ELECTRIC TRAMWAYS.—The municipality of Dvinsk, Russia, will receive tenders for the construction and exploitation of electric tramways. Particulars, specifications, and conditions governing this contract may be obtained from Gorodskaja, Uprawa, Dvinsk, Russia. No time limit is announced for receipt of tenders.

No. 8170. SUPPLIES FOR HYDROELECTRIC PLANT.—Tenders will be received by the under secretary, public works office, Wellington, New Zealand, until May 1, for furnishing water wheels and accessories, switchboard and accessories, generators and accessories, transformers, and traveling crane. Set of drawings and contract documents relating to each of five sections of the hydroelectric plant can be obtained from the Bureau of Manufacturers.

No. 8179. ELECTRICAL GOODS.—An American consular officer reports that a business man in his district, who represents seven German manufacturers of electrical goods, desires to secure the agency of some American company in this line. He thinks that, particularly in small motors and household articles, such as heaters, irons, etc., the American article is much superior to the German and believes he could do a good business. The great activity in building and the tendency to make modern improvements in houses already constructed open a wide field for certain classes of electrical goods.

FINANCIAL NOTES.

There was a considerable show of strength demonstrated in a hitherto jaded market at the close of the week and net advances of small denomination marked the week-end.

It is understood, in expert quarters, that the security market has discounted all nominal adverse features, and, excepting the introduction of some condition not now visible on the financial horizon, there is predicted a general advance in price of securities with a more active market.

The coal strike in Great Britain is well under way, and this is nearer to us than is ordinarily considered, in that the shutting down of industries in England will materially affect export demands for material supplies. The danger of sympathetic movement on this side is not entirely of a negligible character, and this is causing producers here some apprehension.

At the annual meeting of the Kings County Electric Light and Power Company and its affiliated company, the Edison Electric Illuminating Company of Brooklyn, the following were unanimously re-elected directors for the coming year: Frank Bailey, William Berri, A. N. Brady, N. F. Brady, H. C. Du Val, Walton Ferguson, W. W. Freeman, Bernard Gallagher, William V. Hester, Seth L. Keeney, Thomas E. Murray, W. F. Sheehan and J. N. Wallace.

Articles of incorporation have been filed by the Kentucky Public Utilities Company, Louisville, Ky., with $350,000 preferred stock and $800,000 common stock. The officers have been selected but have not yet been elected. They are as follows:—Henry C. Wood, Chicago, president; T. Lindsey Fitch, Louisville, vice-president; Edward S. Toland, Philadelphia, secretary-treasurer; E. C. Goodnow, president of the North Shore Gas & Electric Company, Chicago, general manager and consulting engineer.

The Capital Gas & Electric Company, Frankfort; Bowling Green Gas & Electric Company, Bowling Green; Hopkinsville Gas & Electric Company, Hopkinsville, and Owensboro Gas & Electric Company, Owensboro, have already been merged. The following resident managers have been appointed: George Shinnick, Owensboro and Hopkinsville; Frank Austin, Frankfort, and H. D. Fitch, Bowling Green. A $2,000,000 bond issue, recently authorized, is now being marketed by the new corporation, 80 per cent of the returns to be applied in improvement of the various properties and the remaining 20 per cent to be entered in the company's income account.

United Light & Power Company, of New Jersey six-per-cent three-year notes are offered by Smith-Tevis-Hanford, Inc., of San Francisco, at ninety-nine and one-half and interest. Notes are guaranteed by United Properties Company and are tax-exempt in California.

Boston Elevated gross for February made the largest month's increase in almost a year and a half. February increase was $96,000, or 8.7 per cent, comparing with $33,000, or a 2.5 per cent gain in January; $51,700, or four per cent in December and $73,000, or six per cent, in November. In the first eight months of its current fiscal year Boston Elevated has gained about $347,000 in gross receipts.

Dividends.

Buffalo General Electric Company, regular quarterly dividend of 1.5 per cent, payable March 30 to stock of record March 20.

Chicago City Railway Company; regular quarterly dividend of 2.5 per cent, payable March 30 to stock of record March 5. Books closed March 6, reopen March 16.

Chicago Telephone Company; regular quarterly dividend of two per cent payable March 30 to stock of record March 20.

Consolidated Gas Electric Light & Power Company; semiannual preferred dividend of three per cent, and quarterly common dividend of 1.25 per cent, both payable April 1 to stock of record March 25.

Galveston-Houston Electric Company; preferred semiannual dividend of $3 per share, and common of $1.50, both payable March 15, to stock of record March 6.

Indiana Lighting Company; an initial semiannual dividend of one per cent payable April 1. Books close March 21 and reopen April 1.

Louisville Traction Company; semiannual preferred dividend of 2.5 per cent, and quarterly common dividend of one per cent, both payable April 1, to stock of record March 9.

Muskogee Gas & Electric Company; preferred quarterly dividend of 1.25 per cent, payable March 15 to stock of record February 29.

New England Telephone & Telegraph Company; quarterly dividend of 1.75 per cent, payable March 30 to stock of record March 15.

Standard Gas & Electric Company; quarterly preferred dividend of two per cent, payable March 15, to stock of record February 29.

West Penn Traction Company; quarterly dividend of one per cent, payable March 15 to stock of record March 7.

Reports of Earnings.

KEYSTONE TELEPHONE COMPANY.

The report of the Keystone Telephone Company, of Philadelphia, for the month of January and seven months ended January 31, compares as follows:

	1912	1911
January gross	$ 97,913	$ 96,091
January net	48,697	47,756
Surplus after charges	23,565	23,318
Seven months gross	683,614	668,571
Seven months net	336,954	335,153
Surplus after charges	162,316	163,646

THIRD AVENUE RAILROAD COMPANY.

The Third Avenue Railroad Company reports to the New York Stock Exchange the following consolidated income account of all the companies in the system and of their receivers for the year ended June 30, 1911, and for the six months ended December 31, 1911:

	6 Mos. End. Dec. 31, '11.	Year End. June 30, '11
*Operating revenue	$5,131,865	$9,459,679
*Op. ex., rents & taxes.	3,651,521	6,789,318
Operating income	1,480,343	2,670,361
Non-operating income	8,036	27,163
Gross income	1,488,379	2,697,525
†Interest deductions	371,966	776,803
Surplus	1,116,413	1,920,721

*Includes inter-company items.

†No interest paid on income bonds of Forty-second Street, Manhattanville & St. Nicholas Avenue Railway Company, nor on certificates of indebtedness of Dry Dock, East Broadway & Battery Railroad Co.

AMERICAN LIGHT & TRACTION.

The report of the American Light & Traction Company for the month of January, 1912, compares as follows:

	1912	1911
January gross	$396,530	$401,325
Expenses	10,169	9,741
January net	386,361	391,584

The decrease in net earnings of the American Light & Traction Company for January is due to reductions in rates and increased operating costs, due to extremely cold weather. Had the same rates been in force this year as last, the revenue would have shown an increase of $47,278. The increased expenses of distribution of gas directly due to the severe weather, aggregated $14,751, making the total decreased revenue as a result of these two factors $62,029. This has all been overcome by increases in business, with the exception of $5,223, the decrease shown for the month of January.

NEW YORK STATE RAILWAYS.

The consolidated income account of the New York State Railways Company and its subsidiary companies, for the year ended December 31, 1911, compares as follows:

	1911	1910
Earnings from opert'n	$8,384,434	$7,932,957
Exp., deprec. & taxes	5,386,443	5,228,753
Net earnings	2,997,991	2,704,204
Other income	176,048	166,246
Total income	3,174,039	2,870,450
*Charges	1,646,132	1,603,200
Surplus	1,527,907	1,267,250
Preferred dividends	193,125	249,354
Balance	†1,334,782	1,017,896
Common dividends	1,196,820	897,517
Surplus	137,962	120,379

*Includes dividends on stock of subsidiary companies not owned and proportion of undivided surplus applicable to such stock.

†Equal to 6.69 per cent on $19,952,400 common ($13,604,900 of which is owned by the New York Central).

CLOSING BID PRICES FOR ELECTRICAL SECURITIES ON THE LEADING EXCHANGES AS COMPARED WITH THE PREVIOUS WEEK.

	Mar. 4	Feb. 26
Allis-Chalmers common (New York)	⅞	⅞
Allis-Chalmers preferred (New York)	4	5½
American Telegraph & Telephone (New York)	145⅝	142
General Electric (New York)	161¾	160½
Kings County Electric (New York)	129	129
Postal Telegraph and Cables common (New York)	82½	82⅞
Postal Telegraph and Cables preferred (New York)	70	70
Western Union (New York)	84½	84⅞
Westinghouse common (New York)	73	73¼
Westinghouse preferred (New York)	115	*114
Edison Electric Illuminating (Boston)	296	294
Massachusetts Electric common (Boston)	21	20½
Massachusetts Electric preferred (Boston)	96¼	94
New England Telephone (Boston)	161	160
Electric Company of America (Philadelphia)	11⅞	11⅞
Electric Storage Battery Common (Philadelphia)	55½	53⅞
Electric Storage Battery preferred (Philadelphia)	55½	53⅞
Philadelphia Electric (Philadelphia)	18⅛	18⅛
Chicago Telephone rcps. (Chicago)	139	131
Commonwealth Edison (Chicago)	143½	142
National Carbon common (Chicago)	100	100
National Carbon preferred (Chicago)	115	115

*Last price quoted.

PERSONAL MENTION.

ARTHUR LOCKWOOD, who has been connected with the Western Electric Company is now in the sales department of the Brookfield Glass Company, New York, N. Y.

H. E. BEK and E. A. TRUTH have engaged in consulting electrical engineering and contracting under the name of Kanawha Engineering Company, 901 Kanawha street, Charleston, W. Va.

CHARLES L. HOLMAN, vice-president and general manager of the Laclede Gas Light Company, St. Louis, Mo., was elected president of that corporation at a meeting of the Board of Directors recently.

FRANK J. BAKER, vice-president of the Public Service Company of Northern Illinois, is taking a well earned vacation in Florida. Mr. Baker will return to his headquarters in Chicago about March 15.

F. N. JEWETT, sales manager of the Wagner Electric Manufacturing Company, was the speaker at the Tuesday luncheon meeting on March 5, of the St. Louis League of Electrical Interests at the Mercantile Club. Mr. Jewett took for his subject "Central-Stating Heating."

JACOB FURTH has been elected president of the Puget Sound Traction, Light & Power Company, the large corporation which has been organized to take over the Stone & Webster properties in the Pacific Northwest. Mr. Furth was already president of the Seattle Electric Company, one of the constituent companies.

H. RALPH BADGER, for the last three years associated with the Hoskins Manufacturing Company, Detroit, Mich., as publicity manager and assistant manager of sales, has resigned to confine his attention, for the present, to personal interests. Mr. Badger will be succeeded by Arthur B. Tilton, who has been associated with the Hoskins Company since August, 1911, as assistant advertising manager.

F. R. FORTUNE, Pittsburgh district sales manager of the Cooper-Hewitt Electric Company, addressed the sales department of the Allegheny County Light Company, February 29, on the Cooper-Hewitt and quartz lamps. The talk was illustrated by a demonstration of the various types of lamps. Mr. Fortune's address was followed by a spirited discussion on the part of the members of the sales force of the light company.

E. R. KNOWLES, the well known consulting engineer of New York, has been appointed to an important post on the White House Commission established by President Taft for increasing the economy and efficiency of the engineering departments and buildings of the United States. Mr. Knowles has just finished an investigation of the lighting, heating and ventilating conditions in the Federal Building, at Chicago.

JOHN F. COLLINS, Toledo, O., has tendered his resignation as assistant general manager of the Toledo Railways & Light Company to become vice-president of the Michigan United Railway, with headquarters at Jackson, Mich. Within the present year the latter company will begin the electrification of its steam road, which, when completed, will give 500 miles of electric lines with Detroit, Toledo and Chicago as terminals.

C. M. GARDNER has been appointed representative of the Vote-Berger Company, LaCrosse, Wis. Mr. Gardner is a graduate of the Heriott Watt College of Edinburgh, Scotland, and is an associate member of the Institution of Electrical Engineers of Great Britain. He has been an extensive traveler throughout Europe, India and South America, negotiating and carrying out many large contracts for public, municipal and government work.

FRANKLIN H. REED has severed his editorial connection with *Telephony* and joined the organization of the Traffic Service Bureau, of Chicago and Washington. Prior to his entry into the publication field, Mr. Reed had several years experience in public-utility operating and engineering work. During the past four years he has paid particular attention to the subject of public-utility regulation. His time will now be largely devoted to the development of the Traffic Service Bureau's paper, *Public Service Regulation*, the official journal of the National Association of Railway Commissioners.

E. W. PHILLIPS has been appointed sales manager of Koerting & Mathiesen Company, 22 East Twenty-first Street, New York, N. Y. Mr. Phillips was for several years sales manager of the Edison Electric Illuminating Company of Brooklyn, and for the last three years has been connected in the same capacity with the Excello Arc Lamp Company with offices in New York, Pittsburgh and Buffalo. Mr. Phillips has taken a leading part in the introduction of the flaming-arc lamp in this country, and his long experience in this department of effort assures his success in his new connection.

OBITUARY.

JOHN BAMER, president of the Bowling Green Telephone Company, Bowling Green, O., died suddenly of apoplexy at his home in Weston last week.

GEORGE F. MOORE, manager of an electric light company at Polo, Ill., was killed while making repairs to his plant which were caused by the big storm of last week.

NEW PUBLICATIONS.

MICHIGAN ASSOCIATION.—The proceedings of the eighth annual convention held in June, 1911, have been published in cloth binding. A portrait of President John A. Cavanaugh constitutes the frontispiece.

PUBLIC SERVICE REGULATION.—This is the title of the official journal of the National Association of Railway Commissioners, which began publication in January as a monthly. It is concerned mostly with matters affecting the steam railroads. The publication office is at 30 South Market Street, Chicago, Ill.

COAL ANALYSIS.—In order to supply the constantly increasing demand for information relating to the methods used by the Bureau of Mines in analyzing coal and coke, the Bureau has just issued Technical Paper No. 8, by Frederick M. Stanton and Arno C. Fieldner. This describes the methods in use at the laboratories of the Bureau for analyzing coal and coke, and determining the heating value of these fuels. Copies may be obtained by writing to the Director of the Bureau of Mines, Washington, D. C.

NEW INCORPORATIONS.

BROOKLYN, N. Y.—Fairchild Electric Vehicle Company has been incorporated with a capital stock of $50,000. Frank K. Fairchild, Marcus D. Fairchild and Arthur E. King, all of Brooklyn, are the incorporators.

SYRACUSE, N. Y.—William H. Gough Company has been incorporated with a capital stock of $25,000 for the purpose of manufacturing electrical equipments. William H. Gough, Herbert J. Gough and Samuel Rosenthal are the incorporators.

CLARINDA, IOWA.—Lee Electric Company has been incorporated with a capital stock of $400,000 to deal in electrical machinery. The incorporators are H. R. Spry, A. F. Galoway, G. William Richardson, J. Ren Lee and Rufus E. Lee, all of Clarinda.

NEW YORK, N. Y.—The Elco Electrical Trading Company has been incorporated with a capital stock of $5,000 for the purpose of manufacturing electrical machinery. Lester Henry Appel, Mortimer Thalheimer and T. A. C. Both, are the incorporators.

DATES AHEAD.

Northwestern Electric Show. Minneapolis, Minn., March 16-23.

National Railway Appliances Association, Inc., Chicago, Ill., March 18-23.

American Railway Engineering and Maintenance of Way Association, Chicago, Ill., March 19-21.

Minnesota Electrical Association. Annual meeting, Minneapolis, Minn., March 20-22.

New England Section of the National Electric Light Association. Annual meeting, Hotel Kimball, Springfield, Mass., March 21-22.

American Institute of Electrical Engineers. Pacific Coast meeting, Portland, Ore., April 16-20.

American Electrochemical Society. Twenty-first general meeting, Boston, Mass., April 18-20.

Iowa Electrical Association. Annual meeting, Des Moines, Iowa, April 24-25.

Iowa Street and Interurban Railway Association. Annual meeting, Des Moines, April 25-26.

Association of Iron and Steel Electrical Engineers—American Institute of Electrical Engineers. Joint meeting, Pittsburgh, Pa., April 25-27.

Southwestern Electrical and Gas Association, San Antonio, Tex., April 25-27.

Arkansas Association of Public Utility Operators. Annual convention, Little Rock, Ark., May 20-22.

National Electric Light Association. Annual convention, Seattle, Wash., June 10-14.

Michigan Section of the National Electric Light Association. Annual convention, on board the *Majestic*, sailing from Port Huron, Mich., about June 21.

American Institute of Electrical Engineers. Annual convention, Boston, Mass., June 25-28.

National Electrical Contractors' Association. Annual meeting, Denver, Colo., June 17-20.

Kansas Gas, Water, Electric Light and Street Railway Association. Annual meeting, Manhattan, Kans., October 17-19.

The 1912 Boston Electric Show. Mechanics Building, Boston, Mass., September 28-October 26.

With the Electrical Manufacturers

The Lynn Incandescent Lamp Company, Lynn, Mass., has prepared a circular containing a reprint of an article on the merits of refilled incandescent lamps. It also sets forth the low prices of these lamps.

The H. T. Paiste Company, Philadelphia, Pa., has issued bulletin 82, which illustrates and describes several new pipe taplets, such as the "Easy Pull" elbow taplets, square and round, service elbows, outlet hoods, etc.

The Delta-Star Electric Company, 617 West Jackson Boulevard, Chicago, has issued a new bulletin describing its automatic and non-automatic types of train connectors for use in electric car lighting. The bulletin is well illustrated and will be found of considerable value to those interested in modern electrical devices for this service.

The Pacific Electric Heating Company, Ontario, Cal., is sending out an interesting folder calling attention to the aggressive publicity campaign which it will begin very soon. It offers to include the names of every dealer of its electrical heating appliances in some striking advertisements that will soon appear in some of the national periodicals having the largest circulation.

The Federal Sign System (Electric), Home Insurance Building, Chicago, devoted most of the February number of its house organ, The Federalist, to the Mardi-Gras festival in New Orleans, where a considerable number of Federal specialties are used. The company is sending out a folder calling attention to the time and labor economy resulting from the use of Federal bonding clamps for securing outlet boxes to conduit and pipe.

The Automatic Electric Company, Chicago, Ill., has issued an illustrated bulletin describing its automatic traffic distributor for increasing the economy and efficiency of manual telephone switchboards. This is a fairly simple auxiliary consisting of Keith automatic line switches. It adjusts the number of operators in exact proportion to the load, each operator always working at full efficiency without excessive effort and thus giving a uniform high-grade service.

The Battaglia Electric Fountain Company, long located at 123 Liberty Street, New York City, has been incorporated as the Electric Fountain Company, with O. F. Battaglia as manager. On March 1 the company moved its offices and showroom to 121 West Forty-second Street, and on April 1 it will move its factory to 551 West Forty-second Street, where the building of portable, stationary and aquarium fountains will be carried on on a larger scale than ever.

The Joseph Dixon Crucible Company, Jersey City, N. J., has just put on the market a new chain graphite, especially intended for lubricating the chains of motor trucks and pleasure cars. This preparation is put up in cylindrical sticks incased in a neat cardboard carton and weighing about one pound each. It is made of the same material as the Dixon bicycle stick graphite. It is said to be the most convenient chain lubricant on the market, for a bar may be carried on the car ready for use at any time. To apply, it is simply necessary to rub the bar against the sprocket side of the chain. Unlike oils and greases, it will not collect dust and dirt.

The Brilliant Electric Company, Cleveland, Ohio, has published a bulletin on marine lighting, in which the illumination of modern steel ore boats especially is considered in detail. The bulletin was compiled by Clark Baker. Attention is called to the necessity of equipping lamps for this class of service with suitable reflectors and a detailed description of a complete unit designed by the Brilliant Electric Company, with the co-operation of the American Ship Building Company, is presented. Sectional drawings of a vertical reflector unit and an angle reflector unit are shown. The lighting conditions on board passenger boats are also discussed and methods of lighting the cabins, officers' quarters, passages, staterooms, etc., are suggested.

The Wheeler Condenser & Engineering Company, Carteret, N. J., has published a valuable handbook entitled "Steam Tables for Condenser Work." The first of these tables is based on a vacuum referred to a 30-inch barometer as the independent variable; the second table takes temperature as the independent variable; the third table takes gauge pressure as variable. No tables giving the properties of saturated steam as these do have yet been published; the present tables were calculated especially for this book. The remainder of the handbook is devoted to a discussion of vacuum measurements in general, the errors in vacuum gauge and barometer readings, and constants for their correction. This handbook is intended primarily for assisting mechanical engineers using and purchasing condensing equipment, to whom it will be sent upon request.

The Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., has issued circular No. 1165, which attractively describes the company's 1912 line of fan motors. The most interesting feature is the announcement of a drawn-steel frame used for the first time this year and resulting in great strength and minimum weight. In addition it furnishes a smooth lustrous surface which is adaptable to a high polish such as is not obtainable with the ordinary cast-iron frame. Other recent publications by this company are: descriptive leaflet No. 2298, devoted to the type CCL induction motor; leaflet 2330, describing type JL vertical-edgewise ammeters and voltmeters for direct-current switchboards; leaflet 2390, descriptive of type E 60-cycle alternators for engine drive; leaflet 2389, devoted to similar generators for belt drives; catalog 3002 on type M C commutating-pole, series and compound, direct-current mill motors.

The Macbeth-Evans Glass Company, Pittsburgh, Pa., has published three attractive bulletins dealing with the use of Alba illuminating glassware. One of these is devoted to ornamental street lighting with Alba globes. It is copiously illustrated with day and night views of business and residence streets and boulevards and contains photometric data and curves and specifications of several typical installations. The general subject of ornamental street lighting is discussed and the advantages of Alba glassware for this service pointed out. Another bulletin is devoted to semi-indirect illumination with large decorative Alba units. Two private dining rooms with different designs of bowls are shown. The third bulletin is an artistic catalog showing 50 designs of Alba shades, bowls and globes uniquely engraved. This is an excellent demonstration of the artistic possibilities made available by the wealth of designs of this glassware.

The Stromberg-Carlson Telephone Manufacturing Company, Rochester, N. Y., has issued its statement to the stockholders for the year ending December 31, 1911. During the year there was a reduction in manufacturing profits owing to a falling off in the volume of business and to a greater competition for the decreased total business done in the telephone line during the year. An advantageous sale of the company's former Chicago factory was made in March, 1911. From the profits of that sale and from the collection of accounts and notes receivable, and also from the conversion of some of the company's investments, it was enabled during the year to pay off all the company's indebtedness, which amounted on December 31, 1910, to $497,500, and in addition pay 12.25 per cent of the accumulated dividends upon the company's outstanding preferred stock. The company's plant and factories are in excellent condition, many improvements having been made in its products and some new lines of apparatus have been developed. The capital is adequate and the company owes no debts.

The General Electric Company, Schenectady, N. Y., has issued a group of bulletins which are of more than ordinary interest to the engineer and electrician of industrial plants, the superintendent of the isolated plant, and in fact to all those interested in fair sized generating and operating equipment. Bulletin No. 4917 is devoted to direct-current exciter panels, showing

very clearly the method of connecting up the controlling and measuring equipment and the system of rating and dimensions. Bulletin No. 4901 is devoted to alternating-current switchboard panels with oil switches attached. These are designed for three-phase, three-wire circuits, 240, 480 and 600 volts, 25 and 60 cycles. Bulletin No. 4904 illustrates and describes three-phase panels for use in small or isolated plants, containing but one generator. These panels are not intended for parallel operation nor for switchboards containing more than one panel. Bulletin No. 4905 is devoted to panels designed for general use in small central stations and isolated plants. Such panels are used with one set of busbars to which the generators and feeders are connected and are suited to the parallel operation of generators. Bulletin No. 4919 describes small-plant, direct-current, switchboard panels for the control of three-wire generators from 25 to 100 kilowatts. Bulletin No. 4893 is devoted to a general description of two automatic time switches for alternating-current and direct-curent circuits.

Record of Electrical Patents.

Issued by the United States Patent Office, February 27, 1912.

1,018,409. Game Apparatus. J. W. Culp, assignor to Battery-Ball Manufacturing Co., Jackson, Mich. Various parts of target are electrically connected to annunciators and signal lamps.

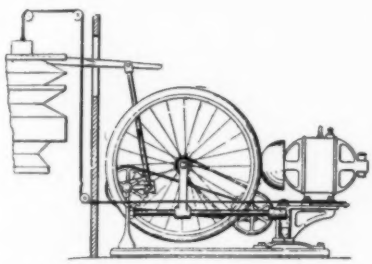
1,018,418. Process of Melting Scrap Metal. A. E. Greene, Chicago, Ill. Alloy steel scrap is added to fused pig iron in an electric furnace.

1,018,435. Telephone Meter. E. H. Martin, Webster City, Ia. Removal of the receiver from the hook closes the talking circuit and starts a clock train which again opens the circuit after a definite number of minutes.

1,018,442. Closing Means for Sliding Doors. R. H. Reh and Y. Burgess, Washington, D. C. An electric motor is geared to a rack.

1,018,443. Block-Signaling System for Electric Railways. K. Richards, Chicago, Ill. Includes two electrically operated semaphores in each block.

1,018,451. Automatic Fire-Protection Signal System. J. E. Shepherd, assignor to Automatic Fire Protection Co., New York, N. Y. Is associated with a telephone system.



1,018,483.—Electric Organ Blower.

1,018,480. Electric Lamp Socket. W. G. Clark, New York, N. Y. Has a base consisting of two relatively rotatable parts carrying switch contacts that are normally locked apart, but which are unlocked and the circuit closed when the lamp is screwed into the socket.

1,018,483. Apparatus for Blowing Pipe-Organs, Harmoniums, or Like Musical Instruments. L. B. Cousans, Lincoln, England. A constant-speed motor mounted on a swiveling base operates the organ blower through a variable-speed friction drive.

1,018,484. Process and Apparatus for Making Insulators. J. P. Dahl-Jensen, assignor to Aktieselskabet Bing & Grondahls Parcellaensfabrik, Copenhagen, Denmark. The porcelain mass is pressed betwen dies to form multiple petticoats and that part of the die between the petticoats is lifted off first.

1,018,486. Cash Register. O. F. Davisson, administrator of T. Carney, deceased, assignor to National Cash Register Co., Dayton, O. An electric motor drives the operating mechanism and is controlled by a circuit-closer.

1,018,500. Forming Device for Metallic Filaments. H. W. Jackson, assignor to Westinghouse Lamp Co. Reciprocating supports carrying filament clamps move into and out of gas receivers.

1,018,501. Electric Cutout or Switch. G. A. Jordan, Brooklyn, N. Y., assignor of one-third to W. H. Jordan and one-third to C. Jordan. A key can be introduced through the wall of a switch box so as to operate a knife switch.

1,018,502. Incandescent Bodies for Electric Lamps. A. Just and F. Hanaman, assignors to General Electric Co. A filament material of coherent and homogeneous metallic tungsten.

1,018,509. Automatic Fire Alarm. J. B. Loughead, New York, N. Y., assignor of one-eighth to G. M. Armour. Operates a detonator and an electric alarm.

1,018,510. Calculating Machine. A. S. McCaskey, assignor to McCaskey Electric Calculator Co., Chicago, Ill. Is electrically operated.

1,018,525. Tool-Holding Means. E. F. Smith, assignor to Smith Electric Tool Co., Cincinnati, O. An electric motor supports and operates a tool in working position on a lathe.

1,018,531. Dynamo-Electric Machine. E. M. Tingley, assignor to Westinghouse Electric & Manufacturing Co. A rotor construction with spacing disks between the end groups of laminae to form circumferential slots for reception of coil ends.

1,018,543. Motor-Driven Fan. T. Abtmeyer, assignor to Westinghouse Electric & Manufacturing Co. The fan motor has a flexible joint between the trunnion frame and base with a helical spring in the hollow base.

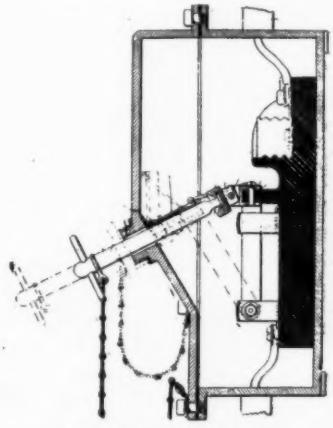
1,018,544. Commutator for Electrical Machines. S. von Ammon, assignor to Westinghouse Electric & Manufacturing Co. Has annular insulating disks between adjacent sets of brushes.

1,018,547. Circuit-Breaker. T. E. Barnum, assignor to Cutler-Hammer Manufacturing Co., Milwaukee, Wis. Has an overload coil and a no-voltage coil, also means to prevent closure of the breaker until line voltage is restored.

1,018,555. Signaling by Electroradiant Energy. C. D. Ehret, Ardmore, Pa. Includes an induction generator one of whose windings is fed by the received energy.

1,018,558. Electric Heater. W. S. Hadaway, Jr., assignor to Westinghouse Electric & Manufacturing Co. Is adapted for flotation in the liquid and comprises an air chamber and an insulated resistance element secured to a submerged wall thereof.

1,018,564. False-Alarm Detector for Fire-Alarm Systems. G. H. Inman, Brockton, Mass., assignor of one-fourth to J. T. Stack. Is dependent on removal of the key.



1,018,501.—Switch Box.

1,018,570. Terminal for Electric Wires. G. C. Knauff, Chicago, Ill. The ends of the wires are hooked into screw-eyes in connectors fitted in a socket.

1,018,571. Dynamo-Electric Machine. B. G. Lamme, assignor to Westinghouse Electric & Manufacturing Co. The outer ends of the rotor coils form an open-work cylinder supported by an internal supporting ring and external band wires.

1,018,576. Combination Sad-Iron and Cooker. C. P. Madsen, assignor to Pelouze Electric Heater Co., Chicago, Ill. An electric flatiron is inverted to form a disk stove over which closely fits the cooker vessel.

1,018,594. Electric Pump Governor. W. V. Turner, assignor to Westinghouse Air Brake Co., Pittsburgh, Pa. Includes two valves for an air compressor.

1,018,596. Inertia Governor for Air Brakes. H. H. Westinghouse, as-

signor to Westinghouse Air Brake Co. Has a manually controlled electrically operated valve with an inertia weight to control the valve upon a certain rate of retardation.

1,018,599. Electric Wire-Feeding Apparatus and Reel Therefor. F. N. Woods, Flint, Mich. Supply wires are connected to the metallic insulated side plates of the reel.

1,018,607. Platting Box. E. L. Dearborn, Fairfield, Cal. Inside the box is an electric fan and an electric lamp.

1,018,642. Seal for Vapor Devices. P. H. Thomas, assignor to Cooper Hewitt Electric Co., New York, N. Y. A platinum cup is sealed into a mercury-vapor inclosure.

1,018,644. Apparatus for the Manufacture of Steel. W. R. Walker and J. H. Gray, New York, N. Y. A combined electric and gas-fired open-hearth furnace.

1,018,646. Automatic Telephone Instrument. J. Weil, Mansfield, Ohio. A desk stand with the transmitter and receiver mounted at right angles to each other on an elbow arm swiveled on top of the stand, this swiveling closing the line circuit.

1,018,648. Electric Switch. R. P. Brown, Philadelphia, Pa. A rotary switch with a helical spring pressing against movable contact plate.

1,018,664. Automatic Alarm-Actuating Mechanism. L. D. Ikenberry, North Manchester, Ind. An electric alarm controlled by a clock with several sets of selective contact pins corresponding to different days and nights of the week.

1,018,666. Telephone System. H. F. Joeckel, Camp Point, Ill. A local-battery, magneto-ringing system with an annunciator at each substation.

1,018,673. Electric Curling Iron. C. P. Madsen, assignor to Pelouze Electric Heater Co., Chicago, Ill. Has a casing rotatable about the heating element.

1,018,727. Electric Furnace. M. Ruthenburg, London, England. The electrodes are arranged to reciprocate vertically through suspended water-jacketed sheaths with insulating linings.

1,018,730. Mouthpiece for Telephone-Transmitters. C. H. Swingle and A. M. Miltenberg, Chicago, Ill. Has a conical member mounted on a central stem that is in turn secured to the inner perforated end.

1,018,765. Motor Controller. J. T. Janette, assignor to Cutler-Hammer Manufacturing Co., Milwaukee, Wis. A reversing controller with two cooperating contact members, one under the operator's control and the other automatic.

1,018,769. Wave-Meter. F. W. Midgley, assignor to J. Firth, New York, N. Y. Comprises a condenser and inductance forming an oscillating circuit, and a self-restoring detector having unipolar connection with this circuit.

1,018,799. Timing Device. C. F. White, Philadelphia, Pa. In connection with a race track, a stop watch is electrically started and stopped and an electric gong rung.

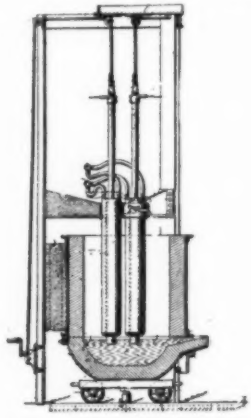
1,018,802. Method of Producing Nitrogen Compounds. C. E. Acker, Ossining, N. Y., assignor to Nitrogen Co. Consists in electrolytically depositing an alkali metal and effecting a reaction between it, while in the mascent state, and cyanogen gas.

1,018,833. Convertible Motor. J. C. Lincoln, East Cleveland, Ohio. Has a commutator that is short-circuited by a ring through centrifugal action after a certain speed is attained.

1,018,864. Safety Device for Elevators. C. E. Baumer and B. Baumer, Troy, O. The car has a set of grippers that are normally held inoperative by electromagnets, but which hold the car from sudden dropping when current fails.

1,018,869. Sag-Preventing Device for Trolley Wires. C. Brizzolara, Richmond, Va. A trolley-wire stretcher in three sections arranged to prevent the middle one from dropping.

1,018,874. Means for the Protection of Electrical Installations from Excess Voltages. G. Campos, Milan, Italy. Has condensers and damping devices



1,018,727.—Electric Furnace.

arranged on the circuit to absorb high-frequency surges.

1,018,884. Electrical Apparatus for Transmitting and Receiving Signals. A. T. Dawson and G. T. Buckham, assignors to Vickers, Limited, Westminster, London, Eng. The receiving instrument has an electric motor with an indicator mounted on a pivoted magnet lying close to the field winding.

1,018,901. Electrolytic Apparatus. H. E. T. Haultain, Toronto, Canada. The electrodes are supported in a tube open at both ends.

1,018,926. Burglar Alarm. F. C. Ries, Macon, Ga. Includes a trigger for rendering the electric alarm bell inoperative.

1,018,934. Electric-Light Switch. C. P. Smith, Oak Park, Ill. A mechanical extension for a socket switch.

1,018,940. Electrical Communicating Apparatus. T. M. St. John, New York, N. Y. A telegraphic transmitting outfit consists of a buzzer, a transmitter and battery.

1,018,963 and 1,018,964. Electric Regulation. J. L. Creveling, New York, N. Y., assignor to Safety Car Heating & Lighting Co. An electric axle-driven train-lighting equipment has a generator regulator and a lamp regulator interconnected.

1,018,977. Electric Sealing-Wax Machine. A. W. Lockard, Baltimore, Md. An electric heating coil is arranged around the wax container.

1,018,981. Registering Device for Telephone Systems. E. M. Northum, Stephens, Ark. A toll pay station with an indicating dial.

1,018,982. Apparatus for Automatically Recording Music. C. W. Nystrom, Karlstad, Sweden. A number of cutting tools are actuated by electromagnets.

1,018,990. Method of and Apparatus for Producing and Utilizing Disk-Like Electric Arcs for Effecting Gas Reactions. F. Rothe, assignor to Elektrochemische Werke, Berlin, Germany. The gases are introduced in such a way as to spread the arc out into a sheet discharge.

Patents That Have Expired.

Following is a list of electrical patents (issued by the United States Patent Office) that expired on March 4, 1912:

535,042. Telephone Apparatus. O. L. Wullweber, Chicago, Ill.

535,051 and 535,052. Electric Arc Lamp. H. F. Davis, Pittsburgh, Pa.

535,060. Demagnetizing Apparatus. C. Houlgrave, Buffalo, N. Y.

535,077. Circuit Interrupter for Alternating Electric Currents. H. N. Potter, Allegheny, Pa.

535,084. Insulating Conduit for Electric Conductors. L. B. Stillwell and C. F. Scott, Pittsburgh, Pa.

535,086. Lightning Arrester. A. Wurts, Pittsburgh, Pa.

535,090. Electric Battery. H. J. Brewer, New York, N. Y.

535,104. Armature-Winding Machine. H. E. Heath, Windsor, Conn.

535,105. Apparatus for Winding Armature Coils. H. E. Heath, Windsor, Conn.

535,106. Method of Forming Armature Coils. H. E. Heath, Windsor, Conn.

535,107. Winding or Taping Machine. H. E. Heath, Windsor, Conn.

535,149. Switch. C. S. Van Nuis, New Brunswick, N. J.

535,173. Drying Electric Cables. C. H. Rudd, Chicago, Ill.

535,199. Incandescent Electric Lamp. F. L. Fowler, Philadelphia, Pa.

535,214. Contact Device for Conduit Electric Railways. F. E. Lodetti, Rondout, N. Y.

535,247. Battery Telephone Transmitter. W. W. Jacques, Newton, Mass.

535,267. Electrolytic Conduit for Beer or Other Liquids. L. Wagner and J. Marr, Baltimore, Md.

535,284. Telephone Transmitter. J. Goodman and H. M. Goodman, Louisville, Ky.

535,289. Telephony. W. W. Jacques, Newton, Mass.

535,294. Closed Conduit for Electric Railways. P. Murphy, Chicago, Ill.

535,297. Sectional Conductor System for Electric Railways. A. Rosenholz, San Francisco, Cal.

535,299. Combined Telegraph and Telephone System. C. A. Shea, Boston, Mass.

535,304. Mounting for Electric Motors. E. A. Sperry, Cleveland, Ohio.

535,321. Electric Heater or Rheostat. J. H. Delany, New York, N. Y.

535,324. Electric Railway Conduit. W. T. Dulany, Jr., New York, N. Y.

535,336. Electric Lamp Support and Cutout. L. Johnson, New Albany, Ind.